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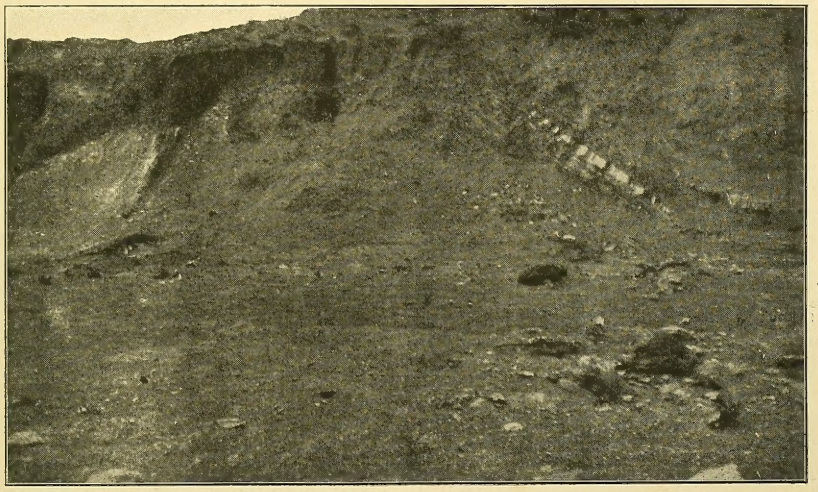
GEOLOGICAL NOTES IN THE ORANGE RIVER COLONY.

By Major B. M. Skinner, R.A.M.C.

In a former article (Science-Gossip, vol. vii., No. 74, p. 135) it was pointed out that Bloemfontein occupies a position where the Karroo strata pass up into the Molteno group of the Stormberg strata. The railway station, level 4,517 feet, marks fairly exactly the altitude at which this change takes place. Above this point sandstones predominate, while below mudstones prevail. Borings made below this level show casts of mudstones, chiefly blue grey, sometimes purplish in tint, with thin bands of sandstone, the same condition being seen in the banks of dongas and in the Bloemspruit. The subjoined photograph, taken in the Bloemspruit about two miles east of the town, shows the bed and lower bank of this stream, where the outcropping rock was of this character. The white band is travertine, covering denuded mudstone. Above the travertine is modern diluvium.



Bed and Bank of the Bloemspruit.

The modern diluvium in this bank—and it is of much the same character elsewhere—varies in places, being sometimes chiefly sand, sometimes clay, or a mixture of the two. In some parts the strata of clay or sand show patches of darker tint, and occasionally of black carbonaceous material, in which the forms of ferns and grasses may be distinguished, generally too friable to be preserved. Near one of these patches, a little below the site of the photograph, some eight feet below the surface, and embedded in a carbonaceous sandy clay, a horn-core was discovered, resembling that of the modern wildebeeste. This particular spot was a most exceptional one among many scores of similar diluvia visited, in that, in addition to the horn-core, two shells of a small *Succinea* were found in a carbonaceous layer. Another exception which may be noted was a section in the stream-bank west of the town, which provided, five feet below the surface, the stone of a peach, lying in a sandy layer of diluvium.

The result of disintegration of the rocks has been the formation of two classes of soil, sand and clay; there are also soils formed from the admixture of these, also a black soil, which is a carbonaceous clay. The last has been formed, whenever found, in localised patches near dolerite hills. It is the result of denudation of dolerite accumulated in an area to which there was no outflow, until the level of the top of the obstruction had been reached, and consequently marks the sites of small bogs. In the present day such patches of black soil are not extensive, and are deeply furrowed by the rush of rain water to lower regions. The pure clay soil is usually found only at the foot of a dolerite hill. It contains boulders of dolerite which are disintegrating, but doing so more slowly than when exposed to air only. Some of these have been denuded through removal of the surrounding clay for brickmaking purposes, and lie in the middle of a clay quarry on the talus slope near New Fort Kop. Seen alone they might be suggestive of other means of production.

The dolerite in disintegrating, besides forming the ferruginous clay above mentioned, supplies the lime which washes down and forms the travertine beneath the diluvium of the valley, and also gives up some magnesia, which is traced in the well-water of the vicinity.

The sandstone rocks supply the vast quantities of sand which form the greater part of the beds of the larger rivers, sometimes very loose and crumbling, at others stiffened with some of the clay from the dolerite. Occasionally interbedded with the sand, dark carbonaceous patches mark the sites of former vegetation, producing ribbon-like dark grey or black streaks, in the banks of the spruits.

Returning to the older rocks, the sandstones and grits which are found as one ascends from the railway level are seen again on Sussex Hill (see S.-G., map, p. 104, vol. vii.), and lying loose on these rocks silicified wood, fragmentary, is occasionally found. On proceeding S.E. from this hill for about a mile a whole tree was discovered, just above the level of Bloemfontein station, lying in strata of thin sandstones and mudstones. The tree was lying with its roots at a slightly higher level than its branches, having evidently drifted down to this position, where in all probability it still remains, for efforts which were in progress for its removal to the Bloemfontein Museum were cut short through the writer having to proceed to another post. Fragments of silicified wood were also observed a little south of Spitz Kop. According to Stow, the Molteno strata were occupied by vast forests of coniferous trees, which are found copiously in certain localities, and generally overlie Coal-measures.

It may be noted here that a rock described in SCIENCE-GOSSIP, vol. vii. p. 34, as appearing like chert was the same as that described on p. 103 as "black, with conchoidal fracture and white streak," and was found afterwards to be carbonaceous shale, metamorphosed by contact with dolerite, the continuation of the same rock near the dolerite being unaffected by the intrusive rock. Since coming to this conclusion, it suggests itself that the rock described by Stow in "Quarterly Journal Geological Society," vol. xxx., No. 120, p. 620, may be of a similar nature.

Proceeding northwards from Bloemfontein along the Brandfort Road, Deale's Farm is passed, just beyond which is the exposure noted on p. 134 of vol. vii. Near this kloof is a flat-topped hill, Plaat Kop. The top of this hill is formed by a dolerite cap; beneath that is a grit which shows signs of denudation previous to its having been covered, while its upper part has been metamorphosed by the overflow. Beneath the grit come the usual sandstones of varying structure, while in the dongas below the base of the hill blue-grey shales are exposed. Rejoining the road, leaving Plaat Kop on the left, the grass-covered surface of the country slopes gradually towards the Rhenoster Spruit, which, where the road approaches it, winds through gorges cut through dolerite, its modern banks being formed of brick earth, and lined with plentiful mimosa. Its bed in places shows the dolerite rock. After clearing these hills, shelving diluvial country leads down to Glen, on the banks of the Modder River. Here is the bridge for the railway running northwards, blown up by the Boers shortly after the occupation of Bloemfontein by our troops, but now reconstructed. The banks of the river are cut out of sand, in which a few sections of mudstones are occasionally visible. These mudstones are well exposed in the bed of the river. The river level here was made to be 4,325 feet; that of the Rhenoster, where crossed a short distance above by the road, was 4,375 feet altitude.

Wimbledon, February 16th, 1902.

THE PLUM AND ITS ALLIES.

By Sophia Armitt.

IN March and April, before the great rush of spring flowers begins, while they are yet few and therefore precious, only the starry celandine, violets sweet and otherwise, coltsfoot, gorse, golden saxifrage, mercury, marsh marigold, perhaps a stray primrose or an early windflower, occur the blossoming of many plum trees and the blooming of the blackthorn in the leafless hedges. Gilbert White's date for it is April 7th to May 10th. Other observers have placed it as early as March 16th. In Mr. Preston's "Flora of Wiltshire" the earliest flowering is February 20th, 1869, and the latest May 5th, 1879. A little later by about a week comes the bullace, and later still the flowers of the wild plum; but all of them generally bloom in April.

These three—sloe or blackthorn, bullace, and plum—are classed together under the common specific name of *Prunus communis*, and separately as sub-species called respectively *P. spinosa*, *P. insititia*, *P. domestica*. The sloe, or blackthorn, is very different from the other two. It is thorny while they are not; its branches spread out at right angles as theirs do not; its flowers appear before the leaves, while the others produce flowers and leaves simultaneously. The black fruit of the sloe is upright, round, and sour; that of the others is hanging, elliptical, or ovoid, and sweet-flavoured, as well as much larger. The blackthorn is much more abundant and more widely spread in this country; it is wild in Europe only; while the native home of the others is Western Asia and Northern Africa. It is more than doubtful if the wild plum is native to Europe, since in the south, where it is supposed to be so, this species is living in hedges and near dwellings with the appearance of a tree scarcely naturalised.

Bullace is to be found apparently wild south of the Alps, in Turkey, and the regions round the

Caspian; but it is likely that, though the hardy form with the round fruit may possibly have been native to Europe, the improved form has travelled like the plum from its original home in Asia. That the bullace and wild plum may have had a common origin is more conceivable than that the sloe should have shared their ancestry. This matter, which brings us to the difficult subject of origins of cultivated plants, is, like all origins, wrapped in mystery. These plants are far too new in the world's history to be found in the geological record; we can go no further back in their story than to the remains of the lake dwellers of Italy, Switzerland, and Savoy, and the record there is not very easily read. In those remains are found many stones of the blackthorn, few, and from one place only, stones of *Prunus insititia*, and no stones at all of *P. domestica*. The ancient people who lived above piles driven into shallow lakes must have fared hardly, since they fed upon sour berries that we deem uneatable, though they may have been in a cooked state. From this it may be inferred that the wild plum in its half-naturalised state has not been in Europe more than some two thousand years.

From the fact that Cato only once mentions Prunus, it is supposed that there could be no cultivation of the plum tree in orchards in his time. Virgil speaks of waxen plums, and Ovid talks of "not only the black, but the nobler kind that borrow the hue of fresh wax." Plums were grafted on to sloes, according to Virgil; in the garden of Horace plums grew on thorn trees. Columella knew three kinds of plums, and Pliny a number of varieties. The Roman name prunus came from the Greek *proumnon*. With the tree and its fruit the name prunus spread from Italy to Central and Western Europe. Our English word "bullace" is Celtic in origin, and sloe is the old Slavic *sliva*, a plum. In early times the two, *Prunus insititia* and *P. domestica*, were not clearly distinguished from each other. It is the first of these, I think, which, cultivated, produces the greengage. In the Mediterranean region plums have not the fine flavour of more northern districts. In Bosnia and Servia plums are cultivated most extensively. There whole forests of plum trees provide the chief food of the people for four or six weeks of the year. The fruit is dried and exported as far as America, pigs and plums being the coin in which these people pay for their importations. Great quantities of this abundant fruit are made into plum brandy, mostly drunk on the spot, but also exported in considerable quantities. How long plum culture has been going on in the borderland of Austria and Turkey is unknown, but Herodotus alludes to the making of a drink from the berries in which North-east Europe is rich as an old Slavonian national trait.

Prunus domestica is found wild in Anatolia, in the country south of the Caspian, and in Northern Persia; *P. insititia* grows in a wild state in Cilicia, Armenia, south of the Caucasus, and in the province Talysch, near the Caspian. It seems probable, therefore, that these regions were the starting places whence plum trees have spread themselves more or less throughout Europe.

From the time of Pliny old writers all relate how, after the destruction of the city of Cerasus, lying between Sinopé and Trapazunt on the Pontic coast, the Roman general, the rich Lucullus, transplanted cherry trees from that region into Italy. Coming from a land of hard winters *Prunus cerasus* was able to spread itself through a country where *P. avium* seems to have been indigenous, so that 120 years after the transplanting by Lucullus the cherry tree was growing on the Rhine, in Belgium, and in Britain. In the Alps and northwards the cherry is better flavoured than near the Mediterranean. To-day the Tyrol, Switzerland, and Upper Rhine are regions where the fruit thrives, and from the surplus harvest thereof in Switzerland is made the well-known cherry brandy, or "Kirschwasser."

The original home of *P. cerasus* seems undetermined. All cultivated cherries come from two species, *P. cerasus* and *P. avium*, the gean. The latter is wild in many places—Asia, north of Persia, Armenia, south of the Caspian, south of Russia, and in Europe generally from the south of Sweden to Greece, Italy, and Spain; also in Algeria. This gean, *P. avium*, was spread through Europe in prehistoric times, and must have been in Italy before Lucullus transplanted *P. cerasus* from Pontus.

As cherry gets its name from a place, Cerasus, whence a good variety at least was brought, so the peach and apricot, in their names *Prunus persica* and *P. armeniaca*, show clearly whence they came. Coming from farther east than the cherry, their fruits later reached Italy. It was only in the middle of the first century of our era, when the Roman Empire came in touch with Armenia and the south shore of the Caspian, that the trees bearing them were brought to Italy, and gardeners asked high prices for the so-called Persian apples and Armenian plums.

The almond, *Prunus amygdalus*, was brought from Pontus, in Asia Minor, first to Athens, where it went by the name amygdalë; later to Italy, where about 150 B.C. Cato called it nux Graeca. A medical book of the early first century A.D. mentions sweet and bitter almonds; and from that time the trees seem to have become almost as common in Italy as they are to-day, when in January, February, or March, as the season is mild or otherwise, gardens are white with the blossoms that come before the leaves.

The cherry laurel, *Prunus lauro-cerasus*, the evergreen of our gardens, from the Levant, produces, when it ripens here, most delicious fruit, as I know, having eaten it cooked during one of the hot summers when it abounded.

Prunus padus, the bird-cherry, is a northern tree, native to Arctic Europe and Siberia, abounding in the north of our island, but not found wild in the south. Its graceful long racemes of flowers come with the new leaves, and the blooming of this bird-cherry, like that of the wild cherry, is one of the events of our northern spring.

The north temperate zone appears to be the home of the genus *Prunus*, which consists there of some seventy-five species. There are some few others in the tropics, but not more, I think, than half a dozen.

Ambleside, February 1902.

OUR COCKROACHES.

By E. J. Burgess Sopp, F.R.Met.Soc., F.E.S.

(*Continued from page* 297.)

OUR next division contains those insects that are truly indigenous to our islands. Omitting *Phyllodromia germanica* Stephens (27) had seven species—viz., *Blatta pallens*, *B. perspicillaris*, *B. panzeri*, *B. nigripes*, *B. livida*, *B. pallida*, and *B. lapponum*; but later authorities have considerably curtailed this list, so that to-day we regard three only as undoubtedly native to Great Britain. They are all small and comparatively insignificant, and are included in the single genus *Ectobia*.

Although *Ectobia lapponum* Linn. (fig. 5) often enters houses in many parts of Europe it is not recorded as having done so in England. It is known from the following two by having the head and antennae black and the disc of the pronotum always dark; it may also be "readily distinguished from *panzeri* by its larger size" (Burr), from *livida* by its darker colour. The elytra, which are testaceous with darker markings and spots, are fully developed in the male, but in the female do not reach to the middle of the abdomen. Its size, according to the compiler of the "Natural History of Insects," published at Perth in 1792, is "not much larger than a fly," but as flies differ somewhat in this respect it might be as well to add that the usual dimensions vary from about three-eighths to seven-sixteenths of an inch (9–11 mm.) in length in the male, the female being somewhat smaller. Unlike the majority of the family this insect can stand severe cold, and although nearly all our records are from the South of England there seems no reason, considering its far range in Scandinavia, why it should not ultimately be discovered further north. This is the species of which Linnaeus wrote that it occasionally attacked the Laplanders' stocks of dried fish. Mr. Burr states the insects are found during summer amongst dried leaves and nettles, under moss, and in similar situations. I believe the species also occurred at "sugar" to Mr. Milton at Brockenhurst during 1899. My specimens are from Bootle, in Lancashire, where it would probably have been imported amongst timber, the bulk of the foreign timber trade of the port of Liverpool being confined to the North Docks, which extend into the former township.

E. panzeri Steph. (fig. 9), the smallest of our British Blattidae, is of a lighter or darker testaceous hue, the male measuring but five-sixteenths of an inch (7–8 mm.) in length, and the female rather less. Apart from its average smaller size, it can usually be easily separated from the preceding cockroach by the paler disc of the shield and by having the vertex of the head light. The dotted wing-cases of the male are lanceolate in form and longer than the body, those of the female abruptly squared behind, as in the last species, but rather shorter. Pronotum with brown markings; legs dark brown or testaceous; cerci dark.

E. panzeri is usually met with in sandy situations, often frequenting the neighbourhood of the Aeolian dunes that form so characteristic a feature of much of our coast-line. It does not, apparently, occur much north of the Thames Valley, most of our records being from the southern counties of England. Mr. Burr (28) mentions it as common in Belgium, Holland, and France, and of occasional occurrence in Germany, Dalmatia, Ferrol, etc. My own specimens come from the coast near Colchester and from Branksome Park, Bournemouth, from which latter locality my friend Mr. Brockton Tomlin has also sent me the larvae. These are very distinct little creatures, having the pro- and meso-notum effectively decorated with a dark triangular figure. A variety of this insect, *Ectobia panzeri* var. *nigripes*, occasionally occurs. It is considerably darker than the type and has black legs. Mr. Burr records it from the New Forest, Devonshire, and Bournemouth, from which last-named locality my own specimens also come.

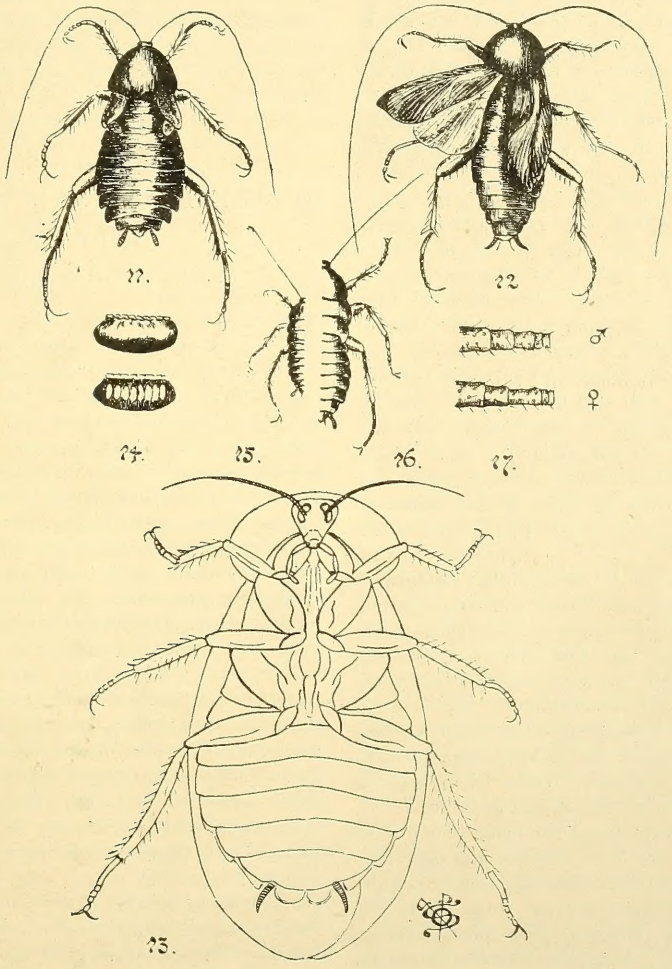
Our remaining indigenous cockroach, *Ectobia livida* Fabr. (fig. 10), barely exceeds five-sixteenths of an inch (8 mm.) in length. Its general hue is lighter than that of the two preceding species, and it still further differs from them in having the legs and cerci pale, the wings and elytra fully developed in both sexes and reaching beyond the end of the body. When there is any difference in the alar organs of the cockroaches it is always the

(27) "Illus. of Brit. Entom."; Kirby and Spence, "Intro. to Brit. Entom."

(28) "Entomologist's Record," vol. xii. No. 8 (1900).

males that have them most fully developed. This little insect is usually taken by sweeping, or amongst leaves, etc., although it has also occurred by beating fir and oak at Broadwater Forest. Mr. Burr records it as widely distributed over Central and Southern Europe, it being, however, commoner Mr. W. E. Sharp obtained it by sweeping in June 1900.

In our final group are included those cockroaches, three in number, that are found from time to time in our seaports, markets, etc.—insects which, although only occasional visitants, we can



11. *Blatta* (*Stilopyga*) *orientalis* Linn., female. 12. *B. orientalis* Linn., male. 13. *Blabera gigantea* Linn., showing underside of cockroach. 14. Oötheca of *B. orientalis* Linn. The lower figure exhibits arrangement of ova in an opened egg-purse, half the number of eggs being exposed to view. 15. Young nymph, *B. orientalis* Linn. 16. Older nymph, exhibiting the prolongation of lateral margins of thoracic segments, or gradual growth of wings. 17. First five joints of antennae of male (♂) and female (♀) of *B. orientalis* Linn. (Drawn by E. J. B. Sopp.)

in the south than towards the northern limits of its range. Amongst his British localities are the New and Charlton Forests, Dorking, Bournemouth, Woking, Bognor, Itchenor, etc., whilst I have also received it from Branksome, near Bournemouth; Ferndown, Dorset; Tunbridge Wells, and Headley Lane, near Dorking, in Surrey, where my friend ill afford to omit. The section contains one of the Goliaths of the race, and many there be who will rejoice that it is of rare occurrence in the land.

Rhyparobia maderae Fabr. (fig. 3) is a large and robust cockroach, measuring from one and three-eighths to over one and a half inches (35–39 mm.) in length, the broad oval elytra, which reach beyond

the apex of the abdomen, serving to give the appearance of still more formidable dimensions. The general colour of the upper surface is lightish-brown with darker markings, the dividing vein on the elytra being very distinct. The size of this handsome insect would alone prevent its being mistaken for either of the above-mentioned cockroaches, it being not only longer but of a generally much stouter build than *Periplaneta americana*, the only one at all approaching it in size.

My own representative is from the Gaboon (or Gabun) district of West Africa, where the species is very abundant, but the insect has occasionally been taken alive in and about the docks and markets of London.

Leucophaea surinamensis Linn. (fig. 4) is a much smaller cockroach than our last, although apparently varying considerably in size, one of my specimens scarcely attaining to nine-sixteenths of an inch (15 mm.) in length, whilst another from St. Paul's measures 24 mm., or very little short of an inch. The elytra are dark testaceous, the pronotum being shining black and narrowly but distinctly bordered with orange along its anterior margin, thus imparting a very pleasing effect to the upper surface of this attractive little insect. The elytra are fully developed in both sexes and reach slightly beyond the apex of the abdomen. Upper surface of body brown with yellow markings; legs brown.

L. surinamensis is a cosmopolitan cockroach, having spread with trade from its former haunts to various parts of the globe. It has very rarely occurred in Britain. Mr. Burr, however, records it from Bognor, where two were taken a few years ago by Mr. H. L. F. Guermonprez, who was of opinion they had been imported amongst bananas from Madeira, and one has since occurred at Kew. The claim of this tropical insect to be included in our lists thus rests on very slender grounds.

The last, but by no means the least, of our occasional visitants is the Titan *Blabera gigantea* Linn. (fig. 13), which has often been captured in Britain. This handsome hexapod attains from nearly two and a quarter to two and three-quarter inches in extreme length; the genus *Blabera*, including amongst its many species the largest cockroaches at present known (29). Its upper surface is light testaceous with a well-marked dark central patch on the disc of the shield, two dark patches on the left elytron, and one on the right. The elytra are of considerable breadth, and altogether the size of this insect serves to at once distinguish it from all our other species. This is the "Drummer" (30) of South America and the West Indies, so called from the fact of its being supposed by natives and others to make a sharp rapping sound during the night-time in the old wooden houses where it swarms in various parts. Cases are recorded in which it has been known to attack dead and even dying persons by nibbling their extremities.

B. gigantea has been taken not uncommonly along the London docks, as well as at Bradford, Huddersfield, and one or two other places. For my "British" specimen of this handsome insect I am indebted to my friend Mr. Willoughby Gardner, who received it some years ago from the Liverpool docks.

(To be concluded.)

(29) The smallest members of the family, measuring less than the eighth of an inch, belong to the Genus *Noctiluca*, and were discovered by M. Simon a few years ago in cases in the Philippines ("Camb. Nat. Hist.," vol. v.)

(30) Drury's "Insects," iii. Preface.

RUBBLE DRIFT AND DRY CHALK VALLEYS.

By Edward A. Martin, F.G.S.

Prestwich was one of the earliest geologists to recognise that, beside the various sub-aërial, marine, and river-valley drifts, there was a fourth that he designated the "rubble drift," and which he first recognised in 1851 in the Sangatte Cliff. This has also long been known under the general term of "head," and it is this which is associated with all the raised beaches around our coasts. These raised beaches are all fairly uniform in structure, containing rounded local and foreign stones, but the rubble drift naturally varies in composition according to locality, and as to whether it has been formed near or far from the source of its constituent parts.

The raised beaches were probably continuous around all our southern coasts; but the contour of the coast being different at the time of formation from that which now obtains, the encroachments of the sea have very widely destroyed all traces of them. The rubble drift, which in some places occurs immediately over the raised beach, as at Kemp Town, Brighton, can also be seen at the following places, in many cases, however, without any beach, as though it were more extensive in its formation than the latter:—Margate, South-Eastern railway station; the gaps on each side of the North Foreland; the cliffs west of Ramsgate; South Foreland, by Kingsdown; Dover West Cliff, where mammoth remains have been found; Folkestone, under the Battery, with hippopotamus and mammoth remains; under Eastbourne, again with remains of hippopotamus and mammoth; Birling Gap; Cuckmere Valley; Ouse Valley, above Newhaven, with bones of a species of *Elephas*; Rottingdean; Brighton, at Kemp Town, including mammoth and hippopotamus; Hove and Portslade; the Sussex Coast plain, at Worthing, Peppering, and Selsey, and especially near Chichester, where were mammoth remains; Hayling Island; Portsea; Bembridge Point, Isle of Wight; Freshwater Gate, mammoth being represented;

Isle of Portland; Chesilton; Dawlish; Hope's Nose, Torquay; many occurrences on south and north coasts of Devon and Cornwall; and Porlock Bay, where are found remains of a submarine forest.

Prestwich was unable to support Godwin Austen's theory, which was supported by Lyell, that the large palaeozoic and crystalline boulders found in the raised beaches and in the bed of the Channel had travelled along an old coast-line extending between Normandy and Sussex. At present the tidal movements carry pebbly beach up channel west to east; but the presence of chalk flints in the Devon raised beaches indicates that the movement of materials was from east to west at the time of their formation. The Ramsgate fishermen are constantly meeting with obstacles to their trawling in the shape of granite and serpentine blocks that strew the bed of the ocean. Prestwich, therefore, concluded that such foreign blocks were brought through the open Straits of Dover in the arms of floes and bergs by a current from the North Sea. Such ice-floes especially became stranded in the bay that stretched from the west coast of Sussex across to Bembridge. Clement Reid has pointed out how great was the deposition of these foreign blocks in this particular area, the Solent River then being perhaps in existence, but the strait of Spithead not yet having been formed. It seemed most probable that the foreign boulders of the raised beaches were derived from the "crystalline, metamorphic, and palaeozoic rocks of Norway," or some of them possibly came from Germany and the Ardennes.

The raised beaches may be regarded with tolerable certainty as contemporaneous with the lowest of the river drifts of the Thames and Somme Valleys, also with the fauna of the cave epoch, and these are but little removed in time from recent alluvial beds. The rubble or head, which contains mammoth remains, is therefore, according to this chronology, more recent than the latest valley drifts.

Certain drifts in the London basin, which Mr. Whitaker places under "Doubtful Deposits," have "the appearance of a local wash," and many of these drifts Prestwich places with the "head," so far as the cause of them is concerned. The character of the head depends entirely upon the character of the local strata, and the fragments of the harder portions of which it is composed are sharp and angular. It follows the slopes of the hills, and as it recedes from its base becomes subangular. As it ranges from the chalk hills the chalky element gradually disappears. The mass takes the colour and composition of a tertiary loam or brick earth. The fact that it contains the remains of land shells and land animals forms a sure guide in tracing the same formation inland or elsewhere. Murchison called it the angular flint drift, and considered it to have been caused by great waves of translation resulting from the sudden elevation and breaking up of the Wealden area by earthquake action; but geologists do not now appeal to catastrophic action as an explanation of the denudation of the Weald.

Lyell considered that the head as it appears at Brighton "might have been heaped up above the sea-level in the delta of a river draining a region of white chalk," with perhaps a slow subsidence during accumulation. He thought that the large blocks and angular flints might have been transported by the aid of ice, the river and its tributaries being occasionally frozen over. This seems the most reasonable explanation of "head."

Mr. Clement Reid calls in the aid of a frozen climate in order to explain the origin of the numerous and now waterless chalk valleys. With the ground frozen in a winter of Arctic severity to a depth of several hundred feet, the otherwise permeable chalk would be rendered impermeable to the summer rains, and the surface waters then, according to Reid, carried down the angular chalky debris which went to form the local coombe rock in the valleys and "head."

Prestwich thought that after the formation of the raised beaches the land was temporarily raised 100 to 120 feet, and the sand dunes, which occasionally occur between the raised beach and the head, were formed. Then came a submergence of about 1,000 feet. Much of the blown sand was denuded away, but the submergence did not last long enough for the establishment of a marine fauna. On the final uprise of the land which followed, the deposition of the rubble drift commenced, being caused by the displacement from a state of rest of a great body of water. In order that the resulting formation, the head, should be in any way different from other deposits, I understand Prestwich to mean that the rise was sudden and the resulting wave-action was of a cataclysmic nature. This without ice would no doubt be sufficient to transport the trail of debris over the West Sussex plain, with but a slight fall in the surface.

Clement Reid has extended the application of his theory of the formation of frozen-soil gravels to the gravels of the Thames Valley. These terrace gravels, which we are accustomed to regard as marking successive stages in the excavation of the Thames Valley by the river, may, he thinks, have after all been laid down contemporaneously at all heights, the determination of the relative ages of such gravels by reference to heights above Ordnance data being of no value whatever. He believes that there were two distinct periods of Arctic cold, as evidenced in the south and east of England, and these were divided by a mild episode when the characteristic Pleistocene mammalian and molluscan fauna inhabited this country. The second glaciation not reaching south of the Wash, the rain in non-glaciated areas

fell on the frozen soil, and thus led to extensive sheets of gravel.

Let us put Prestwich, Lyell, and Clement Reid into the melting-pot and adopt something from each. As one who has been familiar with the dry Sussex coombes for many years, I may perhaps express an opinion as to their mode of excavation and the formation of rubble drift. First of all, the dry coombes must have been caused by water action. Everybody is so far agreed. It is also allowed that the water must have been in motion. The coombes emerge towards the sea with but few exceptions; therefore the moving water must have excavated and moved southwards. The Weald may have been covered with its beds continuously from north to south. If so, the coombes which then existed had not been denuded sufficiently deeply to cut down below the level of the highest part of the existing downs, except perhaps where now are the gaps at Lewes, Devil's Dyke, Saddlescomb, and the southerly flowing rivers now existing. Surely, however, the carving of these valleys would commence long before the chalk finally protruded its head out of the sea at the close of its last period of submergence. I think with each change of level, as the bed of the sea approached the surface, there would be a perfect tumult of currents, and the more rapid the rise the more complicated and unsettled would be the courses taken by such currents. As the land emerged, which we all admit it did finally, however we may disagree on other points, the marine currents would subside, but would in some cases be replaced by fresh-water streams, or even torrents, owing to the saturation of the chalk beneath. I cannot account for the absence of marine shells in the valleys, but they may have all been decomposed during the "pluvial" period, a process which, indeed, goes on over the Downs in the case of dead land shells even now. The marine-shell question need not trouble us. They are not found here on the Downs, yet no one ventures to say that the chalk was not, all of it, under the sea at some time or other, in Quaternary times. Up some of the valleys formed under the sea, the tides would still act and erode. Nothing is more porous than a beach of rounded flints. Yet the tides breaking on the Brighton beach now form miniature hollow coombes with rounded heights between, like, indeed, to downs in miniature. There the sea does the work, although in an instant it has sunk through the porous beach. Where is the necessity to argue for a frozen soil? Repeated tides will often flow through just the same miniature "coombes" over and over again, and these will not necessarily be parallel to one another. Another point, too: the coombes which they make are generally clear of detrital matter, which in their case is carried away to form a "rubble drift," perhaps beyond low tide, with mammalian remains, occasionally in the shape of a dead dog or cat.

As the tides finally retired and the "pluvial" period ceased most of the coombes would be run dry, the rainfall being not greater than could be assimilated by the porous chalk. That marine shells are absent is true. If not explicable, as suggested above, it cannot be denied that they may yet be found.

A point in favour of this theory is the fact that in some of the chalk rubbles there are found land shells, for in such cases we should have the waves of retiring tides drawing denizens of the land into the sea and actually depositing rubble strata containing land shells. Where "head" has been formed to any large extent there must have been, after the retiring sea had done its work, a comparatively large river in existence. In the case of the Brighton "head" there were two rivers which joined before the cliffs were reached. If, as geologists believe, the Weald was denuded during the course of an upheaval or upheavals over the central ridge, surely it is not assuming too much to believe that, after another submergence and another upheaval, that part of the Downs that remained and was nearest the Weald continued to uprise over and above the degree to which the existing coast was raised. In that case the angle of the fall of torrential waters would possibly be sufficient, with the occasional aid of ice-floes, to deposit the head containing flints, angular because of the shortness of their journeys, together with Tertiary sandstones, with their rough corners rounded.

It may be that some gravel has been formed in the way brought forward by Mr. Clement Reid. The great fault, however, with modern gravel geologists is to "overburden the boat," to ride their own particular theories to the death by endeavouring to cause them to explain too much, or, as in the case of Prestwich, by classing too many different deposits together under one name.

The most sensible view of rubble deposits seems to be that of Mr. J. Allen Brown, who claimed that these had been formed at all times since the last period of emergence. He also, very reasonably as I think, attributed the formation of much of the angular gravel to the removing action of subterranean waters upon the chalk, the latter being removed both in solution and mechanically. See also Whitaker's "Guide to the Geology of London," ed. 1901, p. 72, concerning the formation of "clay with flints."

Given a pluvial period, a period of floods, there seems no reason why Lyell should not, after all, prove to be correct in recognising, in some of the rubble drifts of Sussex at least, the deltaic work of rivers piercing the Downs, in this way doing away with the necessity of imagining a submergence of the land here to at least 1,000 feet (Prestwich), the height of the highest occurrence of such drift elsewhere.

23 *Campbell Road, Croydon,*
March 1902.

AN INTRODUCTION TO BRITISH SPIDERS.

By Frank Percy Smith.

(*Continued from page* 299.)

FAMILY *LYCOSIDAE.*

In this family the four posterior eyes are, as a rule, much larger than the four anterior, and form a quadrilateral figure upon the upper surface of the caput. We may in consequence refer to the eyes as being placed in three transverse rows of 4, 2, 2. The tarsal claws are three in number.

The Lycosidae spin no snare, but hunt their prey upon the ground or low herbage, the term "wolf-spider" being consequently applied to many of the representatives of this family. Some species are able to run upon the surface of water, these being commonly known as "raft-spiders."

GENUS *PISAURA* SIM.

In this genus the eyes are not very greatly unequal in size, and the second row is much shorter than the first. The clypeus is high. The legs are long and rather slender. The radial joint of the male palpus is provided with an apophysis.

Pisaura mirabilis Clk. (*Dolomedes mirabilis* Bl., *Ocyale mirabilis* Cb.

Length. Male 10 mm., ema e 14 mm.

This fine species is common in most parts of the country, running rapidly amongst low herbage.

GENUS *DOLOMEDES* LATR.

The spiders included in this genus are very similar to *Pisaura.* They are, however, of a far more robust form. The tarsi and metatarsi are provided with scopulae.

Dolomedes fimbriatus Walck. (*Dolomedes fimbriatus* + *D. ornatus* in "Spiders of Great Britain and Ireland.")

Length. Male 12 mm., female 20 mm.

This handsome spider is almost invariably found in swamps and marshes, but is rather uncommon.

GENUS *PIRATA* SUND.

Eyes of second row much larger than those of first row. Superior spinners decidedly longer than the inferior. Radial joint of male palpus without apophysis.

Pirata piscatoria Clk.

Length. Male 9 mm., female 11 mm.

Cephalo-thorax dull yellow-brown with dark lateral bands. These bands are furnished with a dense coating of brilliant white hairs. Rare.

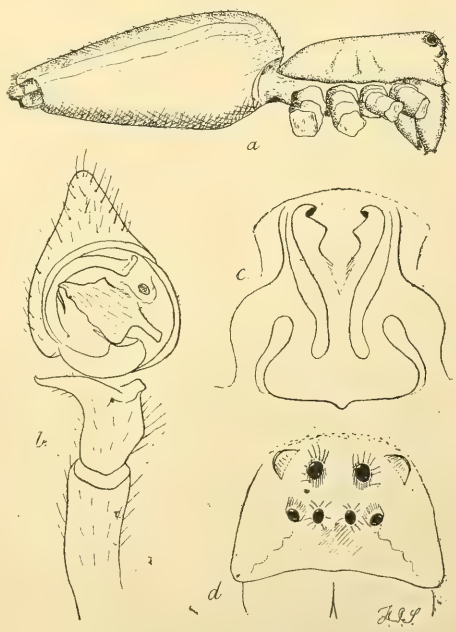
Pirata piraticus (*Lycosa piratica* Bl.)

Length. Male 5 mm., female 6 mm.

Cephalo-thorax yellowish-brown with lateral, but not marginal, dark bands. A very common species.

Pirata hygrophilus Thor. (*Lycosa piscatoria* Bl.)

Length. Male 6 mm., female 7 mm.



Pisaura mirabilis Clk. *a.* Profile of Female, legs and palp truncated; *b.* Palpus of Male; *c.* Vulva; *d.* Eyes of Female, viewed from in front.

Cephalo-thorax yellowish-brown with dark lateral and marginal bands. Common.

Pirata latitans Bl. (*Lycosa latitans* Bl.)

Length. Male 4 mm., female 5 mm.

Cephalo-thorax dull dark-brown. Not rare.

Pirata knorrii Scop.

Length. Male 5 mm., female larger.

Legs distinctly annulated. A very rare species.

GENUS *TROCHOSA.*

The spiders included in this genus are, as a rule, larger and more robust than *Pirata.* The superior spinners are not longer than the inferior. The

anterior row of eyes is never less than the second row.

Trochosa ruricola Degeer. (*Lycosa campestris* Bl.)

Length. Male 9 mm., female 13 mm.

The palpus of the male is terminated by a short claw, and the fang of each falx has a small knob-like projection on its outer side. A very common species.

Trochosa robusta Sim.

Length. Male 10 mm., female 15 mm.

May be distinguished in the male sex from *T. ruricola* by the absence of the projection upon the fang. Very rare.

Trochosa terricola Thor. (*Lycosa agretyca* Bl.)

Length. Male 7 mm., female 12 mm.

This species may be distinguished from the foregoing by the absence of the terminal claw of the male palpus. It is common.

Trochosa spinipalpis F. Cb.

Length. Male 8 mm., female 10 mm.

The radial joint of the male is furnished with a number of stout spines towards its fore extremity on the inner side. Rare.

Trochosa leopardus Sund. (*Lycosa cambrica* Bl.)

Length. Male 7 mm., female 9 mm.

This species may be distinguished by the extremely narrow digital joint of the palpus of the male. Not common.

Trochosa cinerea Fabr. (*Lycosa allodroma* Bl.)

Length. Male 16 mm., female 17 mm.

Allied to *T. leopardus*, but easily distinguished by reason of its large size.

Trochosa picta Hahn.

Length. Male 7 mm., female 8 mm.

The digital joint of the male palpus is very narrow, but not so much so as *T. leopardus*. It may be distinguished from that species by the brilliantly coloured abdomen. It is not uncommon.

Trochosa biunguiculata Cb.

Length. Male 8 mm.

Digital joint terminated by two short claws. Very rare.

GENUS *TARENTULA* SUND.

The spiders of this genus are not by any means sharply separated from *Trochosa*. In the present case the anterior row of eyes is never longer, but is usually shorter than the second row. The clypeus, too, is usually higher than in *Trochosa*.

Tarentula pulverulenta Clk. (*Lycosa rapax* Bl.)

Length. Male 6 mm., female 9 mm.

Eyes of anterior row equally separated. This row is distinctly shorter than the second. Not uncommon.

Tarentula cuneata Clk.

Length. Male 6 mm., female 8 mm.

Closely allied to *T. pulverulenta*, but the tibiae of the anterior legs of the male are dark and swollen. Rare.

Tarentula accentuata Latr. (*Lycosa andrenivora* Bl.)

Length. Male 8 mm., female 9 mm.

This species may be distinguished from *T. pulverulenta* by the distance between the anterior central eyes being greater than that between one of them and the adjacent lateral. Not uncommon.

Tarentula fabrilis Clk.

Length. Male 12 mm., female 15 mm.

This spider may be at once recognised by its large size. The anterior central eyes are larger than the laterals, and the anterior row is almost as long as the second. A very rare species.

Tarentula aculeata Clk.

Length. Male 9 mm., female larger.

Very nearly allied to *T. pulverulenta*, but the legs compared with the cephalo-thorax are considerably longer. The whole spider, too, is much larger than *T. pulverulenta*. Very rare.

Tarentula trabilis Clk.

Length. Male 9 mm., female larger.

The humeral joint of the male palpus is furnished with a longitudinal row of black bristly hairs. Extremely rare.

Tarentula miniata Koch.

Length. Male 5.5 mm., female larger.

Cephalo-thorax dark brown, with a broad central and narrow marginal reddish-yellow bands. Femora of legs distinctly annulated. A local species.

GENUS *LYCOSA* LATR. (= *Pardosa* Sim.)

The spiders of this genus may be recognised by the almost perpendicular sides of the caput. The clypeus is high, and the legs are long and considerably attenuated towards their extremities. The Lycosae are extremely active spiders, usually found running upon low herbage, dead leaves, or even upon the bare ground. The females carry their lenticular egg-sacs attached to the spinners.

Lycosa amentata Clk. (*L. saccata* Bl.)

Length. Male 6 mm., female 8 mm.

Anterior central eyes somewhat larger than the laterals. Palpi of male very dark. Radial and digital joint clothed with coarse black hairs. Near the centre of the palpal organs is a curved, sharp-pointed spine. This species is very common and widely distributed.

Lycosa arenicola Cb.

Length. Male 6 mm., female 8 mm.

May be distinguished from *L. amentata*, which it much resembles, by the very narrow central band upon the thorax. The digital joint of the male palpus is furnished with a short curved spine. A rather rare species.

Lycosa agricola Thor. (*L. fluviatilis* Bl.)

Length.

Very nearly allied to *L. arenicola*. The central thoracic band, however, is dilated towards its fore extremity, and the legs are annulated. Very local.

Lycosa annulata Thor.

Length. Male 5 mm., female 6.5 mm.

Closely allied to *L. amentata*. The present species, however, is smaller, paler, and, as a rule, more distinctly coloured. The palpal organs of the male lack the curved spine found in *L. amentata*, this portion of structure being replaced by a short, somewhat oval process. A common species.

Lycosa nigriceps Thor.

Length. Male 6 mm., female 7.5 mm.

Ocular area black. Legs never annulated. Pale bands on the cephalo-thorax very broad. Not uncommon.

Lycosa farrenii Cb.

Length. Male 5 mm., female larger.

The radial joints of the male palpi are of a swollen form. Rare.

Lycosa traillii Cb.

Length. Male 6 mm., female 8.5 mm.

Very similar to *L. amentata*. Palpus of male terminating with a strong curved spine. Very rare.

Lycosa proxima Koch.

Length. Male 5 mm., female 6 mm.

This spider is very similar in general appearance to *L. amentata*. It is, however, smaller, and the palpi of the male are less hairy. The digital joint, too, is more narrow in form. The palpal organs have near their centre a short obtuse process. Rather uncommon.

Lycosa pullata Clk. (*L. obscura* Bl.)

Length. Male 5 mm., female 6 mm.

This spider is closely allied to *L. proxima*, but the legs are less distinctly annulated, and the palpal organs of the male are provided with an oblique spine-like process in place of the obtuse one found in that species. Common.

Lycosa prativaga Koch.

Length. Male 6.5 mm., female 7.5 mm.

This species is closely allied to *L. proxima*. The palpi of the males are long, the digital joint is narrow, and terminates in a strong claw. Near the centre of the palpal organs is a curved pointed spine, which is comparatively longer than in the closely related species *L. pullata*. Not common.

Lycosa lugubris Wlk.

Length. Male 5.5 mm., female 6.5 mm.

The thorax of the male is furnished with a broad central band thickly clothed with whitish hairs. The digital joint of the palpus is very narrow, and the palpal organs are small. This species is very common amongst dead leaves, and is almost invariably found in or near woods.

Lycosa herbigrada Bl.

Length. Male 5 mm., female 7 mm.

The tarsi and metatarsi of the first pair of legs of the male are somewhat swollen. The central thoracic band in both sexes is broad and strongly constricted near its centre. This species is uncommon.

Lycosa palustris Linn.

Length. Male 5 mm., female 6.5 mm.

Very closely allied to *L. herbigrada*, but the central thoracic band is narrow. The separation of these two species is rendered difficult, however, by the occurrence of, apparently, intermediate forms. A common species.

Lycosa monticola Clk.

Length. Male 5 mm., female 6.5 mm.

This species may be distinguished in the male sex from *L. herbigrada* and *L. palustris* by the tarsi and metatarsi of the first pair of legs being of the normal form and not swollen. A common species.

Lycosa purbeckensis F. Cb.

Length. Male 7 mm., female 9 mm.

Closely allied to *L. monticola*, but usually considerably larger in size. The metatarsi of the first pair of legs also are furnished with a large number of long coarse bristles. Local.

FAMILY *OXYOPIDAE*.

The spiders of this family have usually the eight eyes in four unequal rows. The legs are long, furnished with numerous conspicuous spines, and are terminated by three tarsal claws.

GENUS *OXYOPES* LATR.

Eyes of front row very small. Second and fourth rows of nearly equal length. Clypeus very high. Legs long and very spinose.

Oxyopes lineatus Latr. (*Sphasus lineatus* Bl.)

Length. Female 6 mm., male smaller.

This species is the only known representative of the genus in Britain, and is exceedingly rare.

FAMILY *SALTICIDAE*.

The spiders constituting this family are commonly known as "jumping spiders." They may be at once

ecognised by the peculiar arrangement of the eyes. Four eyes of large size form the anterior row, and the remaining four eyes, usually of much smaller size, form a quadrangular figure upon the upper part of rhe caput. The tarsal claws are two in number.

GENUS *SALTICUS* LATR.

Caput shorter than thorax. Posterior coxae well separated at base. Length of patella + tibia of third leg less than the same portion of the fourth. Femoral and tibial spines absent. Metatarsi either without spines or with a few at the extremity.

Salticus scenicus Clk. (*Epiblemum scenicum* in "Spiders of Dorset.")

Length. Male 5.5 mm., female 6.5 mm.

This spider is very common on garden walls, and may be distinguished from most of its allies by the two oblique bands of white hairs upon the abdomen. The radial joint of the male palpus is furnished with a sharp-pointed curved apophysis.

Salticus cingulatus Panz. (*Epiblemum cingulatum* in "Spiders of Dorset.")

Closely resembles *S. scenicus* in size and markings. The white abdominal bands, however, are broader, and the radial apophysis is rather obtuse. Not common.

Salticus affinitatus Cb. (*Epiblemum affinitatum* in "Spiders of Dorset.")

Length. Male 3 mm.

Allied to both *S. scenicus* and *S. cingulatus*. It is, however, much smaller, and the radial apophysis seems to be intermediate in form between these two species. Extremely rare.

GENUS *HELIOPHANUS* KOCH.

This genus differs from *Salticus* by the possession of numerous metatarsal spines. The humeral joint of the male palpus is furnished with a distinct apophysis. The patella of the third leg is shorter than that of the fourth. The anterior row of eyes is straight or nearly so.

Heliophanus cupreus Walck. (*Salticus cupreus* in partem. Bl.)

Length. Male 4 mm., female 5 mm.

Abdomen with white markings. Legs with longitudinal black markings. Humeral apophysis simple. Not uncommon.

Heliophanus flavipes Koch.

Length. Male 3.5 mm., female 4.5 mm.

Abdomen without white markings. Legs of male striped, of female unicolorous. Humeral apophysis bifid. Uncommon.

Heliophanus expers Cb.

Length. Male 4.5 mm.

Abdomen with white markings. Legs blackish-brown, the tarsi of all and the metatarsi of the first and second pairs being paler. Humeral apophysis bifid. Extremely rare.

GENUS *MARPESSA* KOCH.

This genus differs from *Salticus* and *Heliophanus* by the posterior coxae being almost contiguous. The tibiae of the first pair of legs are very short; hardly, if any, longer than the patellae.

Marpessa muscosa Clk. (*Salticus tardigradus* Bl.)

Length. Male 11 mm., female 12.5 mm.

Humeral joint of male palpus with a protuberance towards its extremity. Digital joint very broad. The whole spider presents a peculiar speckled appearance. It is not uncommon, being found in crevices in wooden fences, from which it occasionally emerges in search of prey.

Marpessa melanognatha Luc. (*M. nigrolimbata* Cb.)

Length. Male 7 mm., female 8 mm.

This rare species may be distinguished by its black cephalo-thorax.

Marpessa pomatia Walck. (*Salticus blackwallii* +[?] *S. promptus* in "Spiders G. B. and I.")

Length. Male 7 mm., female 8 mm.

Cephalo-thorax yellow, with ocular area and margins black. Extremely rare.

GENUS *DENDRYPHANTES* KOCH.

This genus is closely allied to *Salticus*, but the femora and tibiae are furnished with spines.

Dendryphantes hastatus Koch.

This spider, our only representative of the genus, is very rare.

GENUS *HYCTIA* Sim.

Closely allied to *Marpessa*, but the tibiae of the first pair of legs are much longer than the patellae.

Hyctia nivoyi Luc.

This rare species is very similar in general colouring to *Marpessa pomatia*. It is extremely rare.

GENUS *BALLUS*.

This genus differs from the preceding by the caput being as long, or almost as long, as the thorax. Legs 4, 1, 2, 3.

Ballus depressus Walck. (*Salticus obscurus* Bl.)

Length. Male 3 mm., female 4 mm.

The only British representative of the genus. It is rather rare.

(*To be concluded.*)

SPONTANEOUS COMBUSTION IN MAN.

By J. L. F. Mitchell, M.A.

NOT only to science and progress in it, do we owe many comforts and luxuries of life, but freedom from delusion and intellectual slavery. Its progress has been slow but sure, and the prospect of an endless continuance of its advance through the coming centuries of time gives to the mind a feeling of intense satisfaction.

It is not very long since poor creatures were burnt for witchcraft, and as recently as 1633 Galileo was imprisoned for saying the earth moved round the sun—a statement which not the smallest schoolboy would now dare to deny for very shame. It is somewhat astonishing that so late as 1850 the medical faculty were not sufficiently enlightened to be able to deny straight out the assertion by some among their number that the Countess Goerlitz died from spontaneous combustion. As a fact she was murdered, but the deed was so cunningly concealed that the person accused was at the time acquitted. The facts of the case are briefly these. The Countess, with her husband, had a valet named Stauf. One day, upon entering her bedroom, she beheld him rifling one of the drawers in which she kept her jewellery and in the act of appropriating some. After being remonstrated with he menaced her; a scuffle and struggle ensued, in which he seized her by the throat, and in a word strangled her. He then fastened the door to prevent anybody entering. This seems to have been before seven in the evening. At about that hour her husband knocked at the door. Receiving no answer, and imagining her to be asleep, he retired. It would appear that in the interval between this and nine o'clock Stauf put the body of his mistress into a chair, set fire to her dress, and burned her to hide the real cause of death. This he effected so skilfully that none of the bed-clothes were even scorched, and the chair but little injured. He then effected his retreat, securing the door after him. About nine o'clock her husband again returned, and on finding the door still locked became somewhat alarmed and forcibly broke it open. He found nothing but a charred mass instead of his wife, whom he had last seen in health and strength. Of course an inquest was held. Curious to relate, the theory of "spontaneous combustion" had so taken possession of the scientific minds of the time, and for so long a period, that Stauf, who had been accused of the murder, was acquitted. It was argued that inasmuch as the things in the room, and even the bed-clothes, were unsinged she could not have been burnt to death in the ordinary way; therefore, since she did die by burning, she did so by spontaneous combustion.

The end of this remarkable case was, that a short time after the same man Stauf was arraigned for poisoning his master. He was found guilty; and then it dawned upon the public mind that, after all, he might have killed his mistress. The body was accordingly exhumed, and it was then found that, although the head and skull were burnt, the tongue protruded from the mouth in a very unnatural way. After close examination the authorities were convinced that she had been previously strangled. Stauf was accordingly convicted, meeting with merited punishment.

This case happened so recently as 1850, and since that time the theory of "spontaneous combustion" of animals has been proved, especially by Liebig, to be as false as it is absurd. However, such a thing as spontaneous combustion does occur, as when hay, cotton, tow, flax, or hemp in large quantities becomes heated by fermentation, when combustion, which is evidently spontaneous, may ensue. Liebig has clearly proved that it is impossible for the human body to so ignite and burn. He says "a fat dead body charged with alcohol may burn, but a living body, in which the blood is circulating, cannot under any circumstances."

It would be curious to relate, if it were not tolerably well known, that cited cases of spontaneous combustion of human bodies have generally been those of confirmed drunkards and drinkers to excess of brandy or other form of alcohol.

One well-known case is that of Madame Millet in 1725. She was given to alcohol drinking, and one morning the remains of her body were found in the kitchen, about eighteen inches from the open fire-place. She had burned to death, her head, legs, and vertebrae only being left. Her husband, Millet, was accused of murdering her, the ground of accusation being that he had a pretty servant girl with whom he had an intrigue. In this case his innocence was proved; but instead of accounting for the cause of death in what is now seen to be a sensible manner, the verdict was that the wife had died from "spontaneous combustion." This instance is sufficient to show the cause of the combustion of the human body in forty-five to forty-eight cases that have occurred under similar circumstances. From the fact that Madame Millet was but eighteen inches from the open fire-place and in a state of intoxication we may conclude that her garments had caught alight, and being naturally bereft of all control and all presence of mind, she had simply perished in the flames.

Another very absurd case related is that of a tailor, Larivière, and his wife, who, both intoxicated, were left at 7 P.M., and found dead the next

morning at eleven. This, again, was decided to be a case of spontaneous combustion, the fact being forgotten that they had been left in the room with a burning charcoal fire, which had at once added to their stupefaction and set them alight, leaving them a charred mass.

Another famous case is that of Signora Cornelia Zangair Bandi, aged seventy-two, living near Cesena, in Romagna, March 1731. She retired to rest, and in the morning was found reduced to ashes, her face, legs, skull, and three fingers remaining, but her stockings and shoes not in the least burnt. It was generally believed that it was a case of "internal combustion." The lady rose from her bed to refreshen herself, and while she went to the window to open it the combustion had flung her down, consuming her body without any flame, which could set fire to the flooring or the furniture. Rev. Signor Bianchini, the prebendary of Verona, accounted for this by the fact that she used a bath of camphorated spirits of wine, that her frame had become impregnated with the inflammable spirit, and that therefore the cause of death was "spontaneous combustion." It was not stated that the room was heated by an open fire-place, by which she no doubt was burnt. It is a curious fact that such cases are rare in Germany and Russia, where the rooms are heated by closed stoves and not by open grates.

It is again very remarkable to find how tenaciously this theory had clung to the minds of even the most scientific when we read of a case happening so late as 1847 as "unexplained." A man, a confirmed spirit drinker, went to bed with a hot brick at his feet, and was found in the morning dead and burnt to a cinder. So the "Gazette Médicale," September 4, 1847, relates. Assuming that there is no evidence forthcoming to account rationally for such an effect, one would think the comment upon it would rather have been: "To be explained by some natural cause not forthcoming or concealed by those who reported the occurrence." Again, as late as 1853, when Dickens's "Bleak House" was published, the author fully believed in, if he were not fully convinced of—assuming, as we must, that his preface was an exponent of his sentiments—the possibility of the spontaneous combustion of the human body.

Owing to the quantity of water in the human body, Liebig shows that it is plainly impossible. A sponge saturated with alcohol will not burn till all the spirit has been consumed, and even then not at all until the whole of the watery moisture it contains has been evaporated. So of the human body. It is clear that even if all the tissues were saturated with spirit, and this caught alight, it might burn, but it would go out long before it was possible to consume any appreciable amount of the flesh. The fact of spontaneous combustion being possible and manifesting itself in mineral and organic substances, combined with the extremely volatile nature of the vapour of spirit, has no doubt led to the false conception.

It is known that charcoal impregnated with oil is liable to acquire spontaneously a temperature leading to unexpected combustion; phosphorus also, when dry; and the well-known mixture of iron filings and sulphur, moistened with a little water, if buried a short distance below the surface of the ground, "will of itself, after several hours, burst forth in a state of ignition," resembling a miniature volcano; but it has never yet been found that the human body will burn while the blood is in circulation. The heat applied must be so intense as first to evaporate all the water, when circulation will stop; and then the body may be burnt, but not before. In the case of the Countess Cornelia Bandi, therefore, since it is admitted that she got out of bed to open the window for air, and that there were candles on the table, it is most certain that her dress must have caught fire and have been the direct cause of death. If Charles Dickens was forced to believe in "spontaneous combustion," so called, we can easily account for Captain Marryat doing so in 1834. He describes the death of the mother of Jacob Faithful thus: "She perished in that very peculiar and dreadful manner which does sometimes, though rarely, occur to those who indulge in an immoderate use of spirituous liquors—from spontaneous combustion, an inflammation of the gases generated from the spirits absorbed into the system."

The close relation between spirit drinking and death by burning is so obvious as to furnish a simple suggestion for such a death; but Liebig's statement is ample refutation of this popular error.

Regent Square, London.

A Daring Bat.—Mr. B. Harvey-Jellie records in the "Entomologist" that, in the full light of a lantern, a bat settled by the side of a patch of "sugar" and ate one of the moths that had been attracted by the bait.

Algol Stars.—Professor E. C. Pickering gives particulars in the "Harvard College Observatory Circular" of some additional observations of recently discovered variables that have been obtained from examination of the photographs taken with the 8-inch Draper telescope. This gentleman was recently presented with a silver cup, by the staff of the Harvard College Observatory, on the completion of twenty-five years' work as Director of the Observatory.

Geological Society Awards.—The medals and funds of the Geological Society of London are awarded as follows:—The Wollaston medal to Mr. Friedrich Schmidt, of St. Petersburg; the Lyell medals to Mr. R. Lydekker and Professor Anton Fritsch, of Prague; the Murchison medal to Mr. F. W. Harmer; the Wollaston fund to Mr. L. J. Spencer; the Murchison fund to Mr. T. H. Holland; the Lyell fund to Dr. Wheelton Hind; and the Barlow-Jameson fund to Mr. W. M. Hutchings.

NOTICES BY JOHN T. CARRINGTON.

Old Time Gardens. By ALICE MORSE EARLE. xviii + 489 pp., 8 in. × 6 in., with numerous illustrations and plates. (New York and London: Macmillan & Co. 1902.) 8s. 6d.

This charming work must appeal to all lovers of flowers and gardens. It has been produced with great taste, and the illustrations alone are worth the expenditure of the price of the book. The gardens described mostly belong to New England, many of them having been planted and tended by the immediate descendants of the little band of Puritan men and women who, under the leadership of John Winthrop, were the founders of the City of Boston, U.S.A. It was only natural that the home-sick emigrants should, immediately they had leisure, try to create a resemblance to the fair English homes they had left by planting seeds and roots of English flowers in the "old country" fashion. Many of these "old time gardens" of a far-off country are therefore twin sisters to those with which we are so familiar in the manor grounds of English villages. We would especially call the attention of our readers to the quaint device on the title page, which is an ancient "garden-knot" for flowers taken from "A New Orchard and Garden," by William Lawson, 1608. The authoress must have devoted much time and careful preparation before writing this book, and we sincerely hope some lover of gardens will see his way to producing a work on similar lines on those of "Old England."—*F. W.*

Bird Hunting on the White Nile. By HARRY F. WITHERBY. 117 pp., 8¼ in. × 5½ in., with several illustrations. (London: "Knowledge" Office. 1902.) 2s. 6d.

Besides the useful additions to our knowledge of the ornithology of the Soudan, Mr. Witherby has succeeded in placing before his readers a pleasantly written description of his travels and adventures. The work is copiously illustrated from photographs taken by Mr. F. C. Camburn, who accompanied the author as taxidermist, and also by some wash drawings made from photographs taken by Mr. Witherby. Although unable to obtain many mammals in the district explored, the author has added three new species to those already known. Lists of all mammals and birds obtained have been added to the book as appendices. With a few alterations the chapters are reprinted from "Knowledge," in which journal they appeared as articles during 1901.

Atlas of Practical Zootomy. By G. B. HOWES, LL.D., F.R.S., with 24 plates. 12 in. × 9 in. (London and New York: Macmillan & Co. 1902.) 10s. net.

This is a revised edition of Dr. Howes's well-known Atlas of Zootomy. It is founded on the Huxleian "Type System," and consists of a series of beautifully drawn plates, with two pages each of explanatory letterpress. This atlas is too well known to require special commendation.

Food and Drugs. By CHARLES HIGGINSON. xx + 203 pp., 7½ in. × 5 in. (London: Effingham Wilson. 1902.) 3s. 6d. net.

The object of the author in the work before us is to consolidate in a readable form the four Acts at present in operation in connection with the selling of food and drugs. Legislation in this respect having been somewhat piecemeal, it is not easy to understand the relation of one Act to another without the aid of some work of this description. Reports of test cases are given in some instances to illustrate the exact meaning of a clause. Mr. Higginson's method has been to take the Act of 1875 and embody the provisions of subsequent Acts in it, so that the reader may see at a glance how far they modify or enlarge its operation. The four Acts are printed in full at the end of the work, as well as the General Orders issued by the Local Government Board. The volume before us is the second edition, and has been efficiently brought up to date. Mr. Higginson may be congratulated on having brought out a handbook which will afford valuable assistance to all traders in food and drugs, whether wholesale or retail.

Nature's Mysteries. By A. P. SINNETT. 7½ in. × 5 in., 184 pp. (London and Benares: Theosophical Publishing Society. 1901.) 2s.

The volume before us consists, with a few modifications and additions, of a series of articles that recently appeared in the "Sun" newspaper. The author has endeavoured to show that investigation along recognised lines of scientific research will, if sufficiently extended, lead to an explanation of many mysteries now ranked as supernatural. He further maintains that it is impossible to properly study the invisible world of consciousness without having at least a groundwork of knowledge of the physical aspect of matter, as one constantly meets with analogies between the two. Mr. Sinnett states that as it is possible for the Röntgen rays to pass freely through masses of atoms such as flesh, which until recently were considered impenetrable, so it is equally feasible for clairvoyants to be able to see through matter, read letters enclosed in envelopes, and such like phenomena. The book is one well worth reading, as it suggests many new ideas, and is written in an easy, fluent style. We cannot, however, agree with the author in many of his conclusions, especially that with regard to the "Story of Atlantis." We also think that in writing of the Druids as "not much better than savages," Mr Sinnett has not devoted the same amount of time to the study of their history, as to such subjects as spiritualism and clairvoyance.

The Flora of Derbyshire. By the Rev. W. H. PAINTER. 111 pp., 9 in. × 5½ in. (Leeds: Chorley & Pickersgill. 1902.) 3s. 6d. net.

It will be remembered that in 1889 Mr. Painter issued his "Contribution to the Flora of Derbyshire." This little work now offered is supplementary, and contains a considerable amount of information that has been accumulated in the interval by resident botanists and others. A large proportion of this supplement is devoted to the Derbyshire mosses, which are a lengthy list.

Thomas Henry Huxley. By EDWARD CLODD. xiii + 226 pp., 7½ × 5 in. (Edinburgh and London: Blackwood & Sons. 1902.) 2s. 6d.

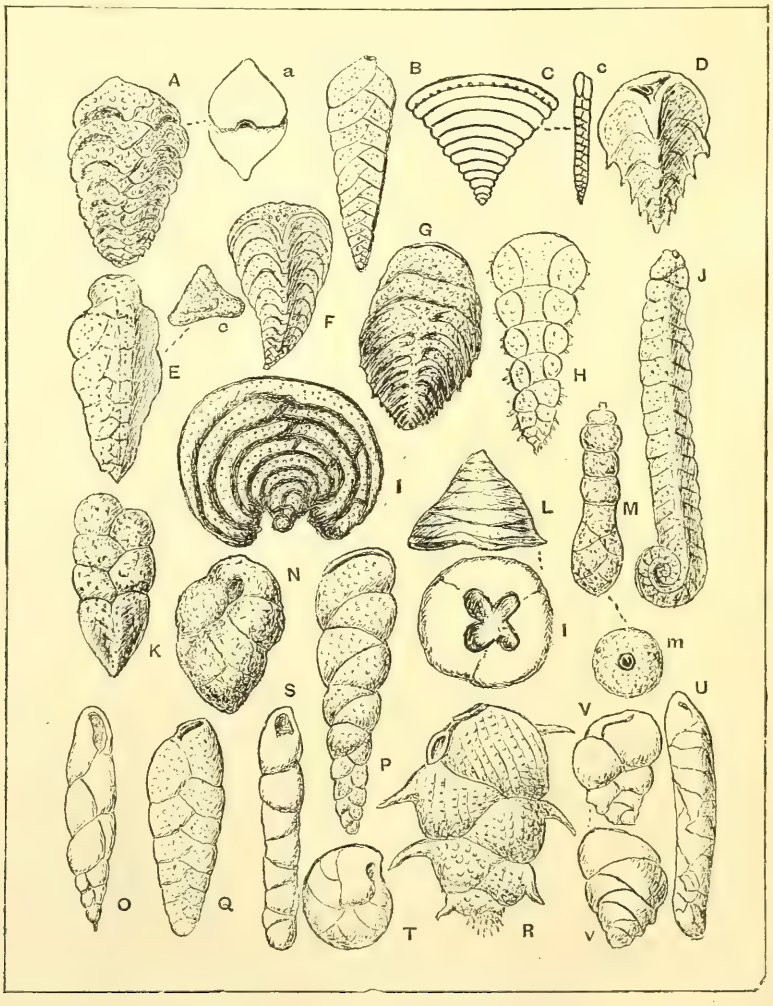
This is an addition to the series of "Modern

English Writers." Mr. Clodd has consequently been obliged to write somewhat sketchily, as this series does not attempt to give an exhaustive biography of the authors under notice. He has, however, given amply sufficient to raise the interest of his readers. Having had the advantage of Mr. Leonard Huxley's "Life and Letters" of his father for reference, it is not to be wondered that Mr. Clodd has been successful in placing within his pages so much information with regard to Professor Huxley.

Messrs. Longmans the plate representing the Textulariidae. The descriptions are generic, with examples of one species in each genus. At the end will be found a useful chapter dealing with the collection of both living and fossil forms.

Class-book of Geology. By Sir ARCHIBALD GEIKIE, F.R.S. xxi + 454 pp., 7½ in. × 5 in. Illustrated with 225 figs. (London and New York: Macmillan & Co. 1902.) 5s.

The fourth edition of this useful handbook for



TEXTULARIIDAE. (*From "Foraminifera," by F. Chapman.*)

Foraminifera. By FREDERICK CHAPMAN, A.L.S., F.R.M.S. xv + 354 pp., 9 in. × 6 in., with 14 plates and 42 other illustrations. (London, New York, and Bombay: Longmans, Green & Co. 1902.) 9s. net.

The sub-title of this book is "An Introduction to the Study of the Protozoa." It will be found useful, not only to the student of these beautiful atoms of nature, but also to microscopists generally. It is a concise account of the foraminifera copiously illustrated. We give by permission of

class-work in geology has been brought up to the present standard of knowledge in this subject. Much of the matter in the former editions has been rearranged, and even to some extent rewritten. Fuller references have also been made to the geology of North America. The Table of the Vegetable and Animal Kingdoms in the Appendix has been fully revised, with the assistance of Dr. F. L. Kitchin. The index to the volume is especially complete, and must greatly increase the value of the work to any student.

More Tales of the Birds. By W. WARDE FOWLER. 232 pp., 7¾ in. × 5 in., with 8 plates. (London and New York: Macmillans. 1902.) 3s. 6d.

We can strongly recommend this prettily illustrated bird-book as a gift for young people. It consists of a series of stories in which birds of various kinds form subjects. By permission of the publishers we reproduce one of the plates to show

"THE LAST OF THE BARONS." (*From Warde Fowler's "Tales of the Birds."*)

how picturesquely they have been drawn. It is entitled "The Last of the Barons."

Smithsonian Institution. lxv + 759 pp., 9¼ in. × 6 in. Illustrated. (Washington: Government Printing Office. 1901.)

The annual report of the Board of Regents of the Smithsonian Institution for the year ending June 30th, 1900, is before us. It consists of the usual statements on the operations, expenditures, and condition of the institution. Accompanying these are some 700 pages of selected articles, copiously and beautifully illustrated. They vary greatly in subjects, and are generally of much interest.

A Popular History of the Ancient Britons. By the Rev. JOHN EVANS, B.A. viii + 414 pp., 9¼ in. × 6 in. (London: Elliot Stock. 1901.) 10s. 6d. net.

In writing this work the Rev. Mr. Evans is really dealing with the Welsh people, and his object is to continue their history up to modern times, as most of the other books dealing with the subject end at the time of the conquest of Wales by Edward I. at the close of the thirteenth century. During the nineteenth century much ancient literature of Wales was examined by competent scholars with Government aid. This has to some extent assisted the author of this useful book.

CONTRIBUTED BY THE REV. J. M. COBBETT, B.A. OXON.

We greatly regret that in consequence of the serious illness of Mr. Carrington, and also of Miss F. Winstone, the Editors, this number of Science-Gossip has been delayed in publication.

We are pleased to announce that Dr. H. C. Lang is recovering from his indisposition in the genial climate of Andalusia. It is expected that his articles on Palaearctic Butterflies will be continued in the June number.

Signor Marconi seems to have silenced his critics by his recent performances in transmitting coherent messages over a distance of some 1,500 miles.

The well-known aëronaut Mr. Bacon is proposing to cross Arabia, photographing and mapping en route. A similar scheme was brought forward recently by Major Baden-Powell with regard to the Soudan. Those interested in balloon research, may like to hear that it is proposed that the Aëronautical Society of Great Britain shall this summer arrange a high ascent in England for the purpose of making some definite observations in the atmosphere which are of paramount importance to aërial navigation.

On March 11th Professor C. B. Poulton, F.R.S., Hope Professor of Zoology in the University of Oxford, delivered the first of a course of two lectures at the Royal Institution on "Recent Researches on Protective Resemblance, Warning Colours, and Mimicry in Insects." Professor Silvanus F. Thompson delivered the Friday evening discourse on March 14th, his subject being "Magnetions in Transitu." The succeeding discourse the following week was given by Geheimrath Professor Otto N. Witt, of Berlin, on "Recent Developments in Colouring Matters." The discourse was given in English.

The last month has seen several new arrivals at the Zoological Gardens. Among the most interesting is a young female snow-leopard, a graphic account of whose capture was given recently in the "Field" newspaper. It has been placed in the house occupied until recently by the lynx, whose death leaves the Gardens without a representative of its species. Another very striking animal is the panda (*Ailurus fulgens*), which has found a place in the Small Cat House. It differs materially from the specimen in the Natural History Museum, being much smaller and more cat-like. The wild horses which, as we noted in these columns, Mr. Hagenback secured some time ago are now on view in the Giraffes' Yard. At the present time the Society is especially rich in lions, and has, in fact, almost more than are required. On the other hand, the cheetah, the only example of its kind in the Gardens, and a great favourite, seems likely to die. It is to be hoped that some exchanges may be effected. The litter of Red River hogs, born in the Gardens, is very flourishing.

Harvard College Observatory has been for twenty-five years under the able directorship of Professor E. C. Pickering, and its staff have marked their appreciation of his labours by presenting him with a silver cup.

By the death, at the age of sixty-five, of Hofrath Professor Moriz Kaposi dermatological science in general and the University of Vienna in particular have sustained a great loss. Since the death, in 1880, of his colleague and father-in-law, Professor Hebra, Dr. Kaposi had been considered the leading exponent of this branch of pathology.

It is announced that, through the Aëro Club, Mr. C. A. Pearson has offered M. Santos-Dumont a prize of £4,000 to make a flight in his airship from London to Birmingham. The offer was made at first directly to the aëronaut; but in compliance with M. Dumont's special wish Mr. Pearson then offered the prize to the Aëro Club, to be competed for openly, as in the case of the Deutsch Prize, which was of the same amount. The flight will not be subject to the same conditions, and there will be no time limit. This is the longest flight M. Santos-Dumont has yet attempted, the distance being about a hundred miles. The Aëro Club have undertaken to find M. Santos-Dumont a suitable building in which to store his belongings.

The Late Richard Schumacher was born January 19th, 1827, at Altona. His father was Professor H. C. Schumacher, founder and for thirty years the editor of the "Astronomische Nachrichten." He at first acted as assistant to his father at the Altona Observatory, and also took part in the measurement of the Danish degree. In 1859 he became assistant to the late Professor Moesta at the Observatory at Santiago, Chili, helping in geodetical operations. Owing to the state of his health he returned to Europe in 1869, and in 1873 was again appointed assistant at the Altona Observatory, which was shortly afterwards removed to Kiel. Here he had the principal charge of the transit circle until the time of his death on February 24th. From time to time numerous papers from his pen have appeared in the "Astronomische Nachrichten."

Mr. R. W. Hanbury, M.P., President of the Board of Agriculture, has appointed a departmental Committee to inquire into and report as to the present position and future prospects of forestry and the planting and management of woodlands in Great Britain. It is further to consider whether any measures might with advantage be taken, either by the provision of increased educational facilities or otherwise, for their promotion and encouragement. The Committee consists of the following gentlemen—namely, Mr. R. C. Munro-Ferguson, M.P., Chairman; Sir John F. L. Rolleston, M.P., Mr. F. Stafford Howard, C.B., a Commissioner of His Majesty's Woods, Forests, and Land Revenues; Professor W. Schlich, C.I.E., Ph.D., Professor of Forestry, Royal Indian Engineering College, Coopers Hill; Colonel F. Bailey, R.E., Lecturer on Forestry, Edinburgh University; Professor J. R. Campbell, B.Sc., an Assistant-Secretary to the Department of Agriculture and other Industries and Technical Instruction for Ireland; Mr. J. H. Lewis, M.P., Mr. G. Marshall, and Dr. W. Somerville, an Assistant-Secretary to the Board of Agriculture. Mr. Reginald Hooker, of the Board of Agriculture, is the Secretary to the Committee.

On March 12th Mr. John Hughes read a paper at the Society of Arts On the "Use of Alkaline Phosphates." The chair was taken by Professor Hall, the Principal of Wye Agricultural College.

Among the illustrated monthlies for March, "Pearson's Magazine" contains several interesting articles, among them being an account of the stone forests of Arizona, an article on various kinds of flying fish, illustrated from photographs, and a sketch of a day in the life of a spider.

We recently noticed an account in a publication of the Hull Museum of a prehistoric war canoe, or rather the carved representation of one. We hear now that a large canoe, formed of the trunk of a tree, has been discovered in Mayo. This canoe is capable of holding twenty men, and is beautifully carved.

A general monthly meeting of the Royal Institution was held in the afternoon of March 3rd, Sir James Crichton-Browne, Treasurer and Vice-President, in the chair. It was announced that His Royal Highness the Prince of Wales had graciously consented to become Vice-President of the Institution. The special thanks of the members were returned to "An Old Member" for a donation of £50 to the Fund for the Promotion of Experimental Research at Low Temperatures.

A Stone-age Gallery has been erected in the Prehistoric Room of the British Museum, and contains an admirable series of exhibits, illustrating the tools and weapons of man prior to his acquaintance with the use of metals. Affixed to the wall near the stairs by which the gallery is reached is a map of England and Wales, showing the principal sites where remains of the Stone Age have been found. These lie south of a line drawn from the Wash to Bristol Channel, and are marked by white-headed pins, while black-headed pins show the sites of caves from which traces of the presence of man have been recovered. The Stone-age Gallery will perhaps never be a "popular" show, but it is visited by a large number of people interested in the subject, and that number is on the increase. The exhibition is a valuable addition to the Ethnographical Department of the Museum.

Lord Rayleigh on February 27th, at the Royal Institution, gave as the Bakerian Lecturer a paper On the Law of the Pressure of Gases between 75 and 150 millimetres of Mercury. In this he stated that the observations recorded were intended to bridge over in some degree the gap between the very low pressures (below 1·5 mm.) dealt with in a recent paper and pressures approaching the atmospheric for which the usual mercury column and cathetometer method are adequate. The principal novelty consists in the use of two similar manometric gauges. Pressures in the ratio of 1 : 2 are obtained by the use, first of a single gauge, and, secondly, of the two gauges connected in series. The equality of the gauges is tested by observations upon them when combined in parallel. The use of these gauges allows abundant accuracy in the measurement of the pressures and the difficulties relate rather to the adequate determination of volumes and temperatures. The results show that within the very smallest limits of variation, air, hydrogen, oxygen, and argon obey Boyle's law. In the case of nitrous oxide a deviation was observed in the direction that might be expected.

In the "Irish Naturalist" for March Dr. Scharff figures and gives an account of a white-beaked dolphin stranded in Dublin Bay.

The Vaccination League have been investigating rumours as to the alleged ill effects of the vaccination of employés in certain business establishments, and have received answers from the various employers, who state that there is not a word of truth in the stories that have been circulated that arms had been amputated in consequence.

One Hundred and Fifty Thousand marks, or £7,500, have been guaranteed by private individuals for the establishment of a Cancer Research Institute at Frankfort-on-the-Main. The Berlin Committee for the Investigation of Cancer have received from German doctors material covering twelve thousand cases, from which it appeared that cancer was not hereditary, but contagious.

The nervousness which many persons feel about electric traction and currents generally should be allayed by the papers read recently at the Institute of Electrical Engineers. Mr. A. P. Trotter showed, from the results of a number of personal experiments, that the electric pressure ordinarily in use for purposes of traction, 500 volts, is only likely to do serious mischief under exceptional circumstances. It is fortunately improbable that this limit is not likely to be much exceeded.

A newspaper says that the seismographic instruments of the University Observatory at Moscow duly recorded the disturbances at Shemakha, in Transcaucasia, a distance of no less than 1,400 miles as the crow flies. The earthquake shocks took place at 12.15 p.m. at Shemakha, local time, and were noted by the Moscow instruments at 12.13 p.m., that is, allowing for the 35 minutes difference between the local times of the two places, little over half an hour after they had occurred. It appears that the vibration of the earth's crust thus travelled at the rate of 800 metres per second.

At a recent meeting of the Royal Society Sir Norman Lockyer read a paper on the effects of pressure on the spark discharges from metallic substances, which had an important, though indirect, bearing on the interpretation of the phenomena recently exhibited by the new star in Perseus, and previously by that in Auriga. Here certain of the bright lines in the spectrum were found to be associated with absorption lines on their more refrangible sides. This appearance he had attributed to the presence of two bodies moving with a very great relative velocity, one causing a radiation, the other an absorption spectrum. This interpretation had been questioned, results of experiments being quoted as adverse, and it had been suggested that the pairs of lines were more probably due to high pressure. In order to test this hypothesis the author had made experiments with iron, silver, lead, copper, zinc, and magnesium under water by means of which certain experimental difficulties were avoided and very high tensions obtained when electric sparks were discharged. The results, which he described in detail, proved to be very different from those which had been observed in the spectra of the new stars, thus demonstrating that, whatever be the cause, it cannot be that which produces the appearances presented in the spectrum of the spark in water.

A CONTRIBUTION to the botany of West Lancashire appears in a paper reprinted from the "Naturalist," by Mr. S. Lister Petty. It refers especially to the Silverdale area.

MESSRS. BLACKIE & SON, LIMITED, have issued their new "Circle Series" of Science Note-books. They are of the usual exercise-book appearance, but ruled in definite squares for centimetres, quarter-inch, and tenth of an inch. They are only one penny each.

WE regret to record the death of Dr. Emil Holub, the well-known African explorer. His book on the countries formerly known as Monomotapa and the Marutse-Mambunda Kingdom was recognised as an important contribution to African literature. He wrote also volumes on African colonisation and on the big game and birds of the region.

MR. WILLOUGHBY GARDINER, F.L.S., has compiled a useful list of Hymenoptera Aculeata observed in Lancashire and Cheshire. Unfortunately, with the progress of building suburban Liverpool some of the best localities in the district are rapidly changing in character. It is, therefore, well to have so full a list of the bees, wasps, and ants of that district as has been issued by Mr. Gardiner. His notes are of more than passing interest.

A PREHISTORIC sepulchral monument, of a kind hitherto unknown in Europe, has been discovered at Bleasdale, in Lancashire, by Mr. S. Jackson. A paper on the discovery has just been issued by the Lancashire and Cheshire Antiquarian Society. It is well known that "standing stones," whether solitary or in groups such as circles, are often memorials of the dead, whatever other purpose they may have served; but the remarkable feature in the Bleasdale monument is that wood has taken the place of stone.

THE "Medical Press and Circular" has a very interesting account of decapitation. According to the idea of a surgeon in the United States Navy, who closely watched the beheading of thirty-six Chinese criminals in Canton, death was not instantaneous, but came almost immediately after the sword-stroke, and was due to syncope. The interesting features were, that in many cases a decided effort to swallow was shown; in several attempts were made to articulate in a deliberate manner. The faces showed a momentary look of intelligence as they fell, with a natural movement of the eyes as if looking, and an opening and closing of the lids.

THE deposit of a specimen of the long-haired, or Mexican, spider monkey (*Ateles vellerosus*) at the Gardens of the Zoological Society is a matter for congratulation, as up to the present time English naturalists have not had an opportunity of examining a living example of this species. It ranges farther north than any other member of the genus, being found in Mexico, and is said to occur in the upper part of the basin of the Tampico River, about 23° N. latitude. On the opposite side of the room is a full-grown example of the very rare red-bellied spider monkey (*A. rufiventris*) from Colombia, of which only one other example has been received by the Society, and that just thirty years ago. Nothing is known of the habits of this species, which owes its popular and specific names to the rufous coloration of the under surface, the rest of the fur being black, and rough in texture.

AN illustrated reprint has been issued of a paper read by John Cadman, B.Sc., F.G.S., before the Institute of Mining Engineers in October last. It deals with the ironstones found in the North Staffordshire Coalfield.

THE thirty-second annual report of Wellington College Natural Science Society for 1901 contains a plate of eolithic flint implements found on Finchampstead Ridges. There is other information showing that the Society is taking an intelligent interest in the district surrounding the College.

THERE are several important papers in the last issued "Journal of the Marine Biological Association," vol. vi., N.S., No. 3. They deal with the marine fauna of the estuary of the river Exe, the plankton of the Faröe Channel and Shetlands; also other important subjects, including a report on "The Second International Conference for the Exploration of the Sea," held at Christiania in 1901.

THE "Proceedings of the Thirteenth Annual Meeting of the Association of Economic Entomologists" has been issued by the Government Printing Office at Washington. The U.S. Department of Agriculture has printed this report, according to its custom. There are two illustrations representing the manner of destroying weevils which attack peach and plum trees in Georgia. The illustrations show a large number of persons employed on this work.

A PAPER was read before the Royal Meteorological Society on March 19th by Mr. F. J. Brodie on "The Prevalence of Gales on the Coasts of the British Islands." This dealt with the thirty years between 1871 and 1900. The worst year was 1883, and the quietest was 1889. The highest velocity of wind was on January 12th, 1899, being 78 miles per hour. Forty-three per cent. of storm systems advance from some point between south and south-west, 39 per cent. have an easterly motion, and less than one per cent. move westwards.

IT is pleasing to find that Sir James Musgrave, of Carrick Lodge, Co. Donegal, has forbidden his keepers to destroy a couple of golden eagles which have appeared on his estate. Another one, measuring 6½ feet across the wings, was unfortunately trapped; and this led to the preservation of the remaining birds. Sir James Musgrave welcomes the visits of naturalists to his estate, that runs for thirty miles along the coast of Donegal, and includes the celebrated "Tormore" breeding place for birds, which is strictly preserved.

THE latest outcome of the "nature study" movement is an association which is to hold an exhibition of everything connected with nature teaching, in the Gardens of the Royal Botanic Society of London on July 23rd and the following days. The Hon. John Cockburn, K.C.M.G., is the chairman of the executive committee. He, it will be remembered, has been Minister of Education and Premier of South Australia; so those who look for valuable education results from the holding of the exhibition will have the greater reason for their expectancy. We shall await the report of the committee with interest. Any details as to the exhibits which it is suggested should be offered can be obtained from the hon. secretary, Mr. J. C. Medd, at the Gardens, or Stratton, near Cirencester.

MICROSCOPY

CONDUCTED BY F. SHILLINGTON SCALES, F.R.M.S.

ROYAL MICROSCOPICAL SOCIETY, February 19, Wm. Carruthers, Esq., F.R.S., Vice-President, in the chair. The Chairman called attention to an interesting exhibition by Mr. Conrad Beck of typical bacteria as being exceptionally clear and instructive specimens. So clear were they that no difficulty need in future be experienced in recognising them. The Secretary, in the absence of the author, read a paper by Mr. Nelson on "Polarising with the Microscope," wherein the use of tourmalines was advocated. One tourmaline, of a smoky tint with the slightest dash of pink, free from veins or specs, and not less than $\frac{1}{4}$ inch in diameter, should be mounted in a cap to fit over the eye-piece. The other tourmaline might be of the ordinary yellow green variety, but larger, about $\frac{4}{10} \times \frac{6}{10}$ inch, mounted in a metal screen, $2\frac{3}{4} \times 3\frac{1}{2}$ inches, so as to exclude all light not passing through the tourmaline. This screen is to be placed in front of and close to the lamp chimney. Any form of substage condenser can be used with this new arrangement of tourmalines, with the exception of apochromatic condensers, which should not be used in polarised work, because the fluorite used in their construction itself polarises. The images obtained by this new method will be just as critical as those in a microscope where no polariscope is used. The paper concluded with an explanation of the advantages obtained in the adoption of this arrangement in the investigation of phenomena due to the interference of polarised light known as "rings and brushes." Mr. Karop thought it would be a great advantage if a tourmaline prism could be rendered effective, as Nicol prisms were expensive; he thought, however, that a sufficiently large piece of flawless tourmaline would be as expensive as a Nicol prism. The Chairman announced the death of Mr. A. W. Bennett, the editor of the Society's journal. Mr. Bennett had been a member of the Council for many years, and had been a vice-president.

QUEKETT MICROSCOPICAL CLUB.—At the meeting of February 21st Mr. George Massee, F.L.S., President, was in the chair. The Secretary announced the additions to the library. These included a very elaborate work on the "Cladocera of Sweden," by Dr. Lilljeborg, presented to the Club by a member and officer of the Club who wished to remain anonymous. The volume contains eighty very fine plates and was handsomely bound. A very hearty vote of thanks was passed to the donor of this valuable gift. The ballot for president, officers, and committee was taken, Mr. Neville and Mr. West being appointed scrutineers. The names recommended by the Committee were unanimously approved. The thirty-sixth annual report was read by the Secretary and the annual financial statement by the Treasurer. The adoption of the report and statement was carried unanimously. The subject selected by Mr. Massee for his presidential address was that of the Coprophagous Fungi. By means of many coloured drawings he gave the members an idea of the numerous and curious fungi that were found growing upon dung, and he recommended the study of these organisms to the majority of microscopists either as a relief to their normal work or as an interesting occupation. The methods of propagation were clearly explained, and many curious facts were noted in that connection. The general direction of their development was indicated. A passage of the spores through the alimentary canal of some animal appeared necessary to the continuation of some species. Over seventy different species were found on one fragment of their pabulum. Mr. Massee also described the methods of cultivating these organisms and of obtaining pure cultures. The address was listened to by the meeting with the greatest interest, and a vote of thanks to the President, proposed by Mr. J. G. Waller, seconded by Mr. J. Mason Allen, was carried unanimously.

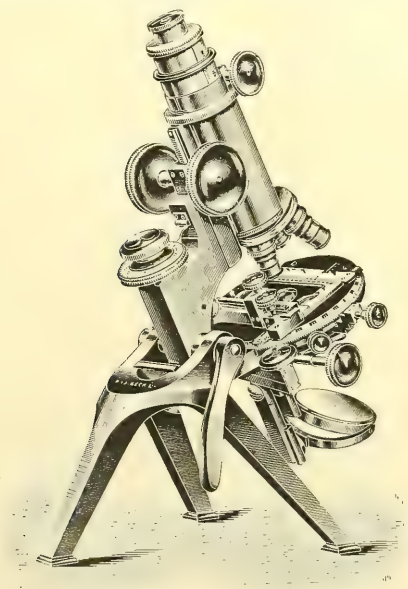
A RARE OLD MICROSCOPE.—The photograph reproduced herewith represents a very fine and carefully preserved specimen of the once famous "Pritchard" microscope, which has recently come into my possession. The accompanying picture will doubtless be interesting to microscopists as an illustration of the great advance that has been

THE OLD "PRITCHARD" MICROSCOPE.

made during the past century in the construction of their favourite instrument. Pritchard is probably best known to modern microscopists as the author of "Pritchard's Infusorium"—that wonderful book on rotifers, diatomaceae, etc., which has induced so many to take up the microscope as a hobby and study. Although I do not see his instruments figured in any of the modern handbooks, he was also known as a maker of microscopes. Indeed, in the earlier part of the past century his instruments enjoyed a high reputation

and we are largely indebted to the researches of himself and Dr. Goring for the improvement in our present object-glasses. The microscope to which I have directed attention fully maintains this maker's reputation for excellent workmanship. In spite of its age, it is still in working order, and its lenses, especially those of the eye-pieces, will bear favourable comparison with those of more recent date. One of the eye-pieces differs from any I have previously seen, having three lenses, and objects viewed with it are presented to the eye with almost stereoscopic effect. One of the most interesting features in the instrument consists in its adaptability for use as an ordinary dissecting microscope. This is effected by simply removing the body from its fitting and substituting a simple lens in its stead. There is an ingenious contrivance at the nose-piece for preventing injury to the front lens of an objective through its being racked down upon the cover-glass of the slide under examination. When looking at this fine old instrument one cannot help feeling admiration for the clever old mechanic and optician who made it at a time when machine tools were almost unknown, and who yet produced work which will stand comparison with that of the present day. I may add that I am informed that Mr. Pritchard died in London on November 24th, 1882, aged 78 years.—*J. C. Webb, F.E.S.*, 218 *Upland Road, Dulwich, S.E.*

Beck's "Imperial" Microscope.—We give herewith an illustration of this microscope in its most complete form (model 1,101), as described



The "Imperial" Microscope.

by us in detail last month (*ante*, pp. 309, 310). The block did not reach us until after we had gone to press.

"Magnesia" Lime Cylinders.—Those of our readers who use the oxy-hydrogen light for photo-micrography or projection purposes will be aware of the tendency of even the best "limes" to crack, whilst the rapidity with which they slake makes it seldom practicable to use a lime on more than one evening. This is, of course, a special drawback to the photo-micrographer, who may only require an exposure or two. We have recently tried some "magnesia" lime cylinders, which do not slake, and therefore require no sealing up, and have had one of these in use without deterioration for some weeks. The intensity of the light is little less than that of the ordinary limes. We obtained these limes from Messrs. Townson & Mercer, of 89 Bishopsgate Street Within, E.C., price 2s. 6d. per dozen, but they can doubtless be got elsewhere as well.

MEETINGS OF MICROSCOPICAL SOCIETIES.

Royal Microscopical Society.—20 Hanover Square, W., May 21st, 8 p.m.

Quekett Microscopical Club.—20 Hanover Square, W., May 2nd, 7 p.m.; May 16th, 8 p.m. Excursions: May 10th, Hadley Wood; May 24th, Chingford.

Manchester Microscopical Society.—Grand Hotel, Manchester, May 1st, 7 p.m.; mounting section, May 15th, 7 p.m.

ANSWERS TO CORRESPONDENTS.

S. W. B. (Sleaford).—The authoritative and best microscopical publication in the world is the "Journal of the Royal Microscopical Society," issued to Fellows every two months, and sold to others at 6s. per number. Its important features, apart from the transactions and proceedings of the Society and the papers on microscopical matters read before the meetings, are its excellent summaries of current researches relating to Zoology, Botany (principally Invertebrata and Cryptogamia), Metallurgy, Microscopical Methods and Technique, New Microscopes, Apparatus, etc. It is, of course, in no sense "popular," but is indispensable to serious workers. The "Journal of the Quekett Club" is published twice a year, at 3s. 6d. per number, and contains interesting articles on microscopical matters, reviews of new books, as well as reports of the meetings of the Club. It is supported mainly by enthusiastic amateurs, whom the Club endeavours specially to help. The "Quarterly Journal of Microscopical Science" is published by J. & A. Churchill at 10s. per number. It appears quarterly, and contains advanced papers on subjects concerned with microscopical research, contributed by those who have been engaged in definite specific investigations. Science-Gossip has always been looked upon as the microscopical journal for amateurs, and it welcomes original contributions and communications on this and all kindred subjects. Latterly special attention has been paid in its pages to new instruments and apparatus, as well as methods of technique. "Knowledge," published at 6d. monthly, holds a similar position amongst astronomical readers, and has recently added a microscopical column. The American "Journal of Applied Microscopy" is devoted mainly to technique and microscopical methods, suitable for laboratory as well as other workers. It contains also selected summaries or reviews of microscopical literature. It is sold in London by Dawbarn & Ward, at 4d. monthly. The "American Monthly Microscopical Journal" is also issued monthly at the same price. If you can read German, the "Zeitschrift für wissenschaftliche Mikroskopie," published in Leipzig, is issued quarterly for a yearly subscription of 20 marks, or

a like number of shillings. It contains original articles, summaries, notes on apparatus and technique, and a list of new books.

EXTRACTS FROM POSTAL MICROSCOPICAL SOCIETY'S NOTEBOOKS.

[Beyond necessary editorial revision these notes are printed as written by the various members.—Ed. Microscopy, S.-G.]

(*Continued from page* 312.)

Rosa canina.—Commencing with the middle section, we notice the structure of the pith to be composed of groups of large cells radiating from groups of small cells. These latter are the cut ends of a network of active, living elements, and the larger cells are only so much packing. The cells are all very strongly pitted. Bounding this pith are the wood bundles with the fascicular cambium active, and the interfascicular cambium just commencing its operations. Beyond the cambium lies the bast tissue, the phloëm or soft bast on the inside, the sclerenchyma or hard bast on the outer. Outside this comes the cortex, the chlorophyll-bearing tissue, with cells whose longer diameters are arranged tangentially. At the outer edge of the cortex, bounded by the epidermis, may be seen patches of cells with their longer diameter coinciding with the line of growth, so that they now present their shorter diameter to the observer. These did not contain chlorophyll. The active cortex corrugations separate these strings and extend to the epidermis. It is upon these lines of chlorophyll-bearing tissue that we find the stomata of the stem. In the cortex may be seen several compound raphides. The prickle is distinguished from the thorn by the fact, as may be here seen, that the wood does not enter into its composition, it being simply a defensive outgrowth from the cortex. It is composed of fusiform cells, strongly pitted, and when developed strongly lignified. Between the prickle and the cortex is an abscis layer providing for the fall of the prickle, though I cannot see the advantage resulting from it. By careful examination of the prickle we can see that wherever there is a crystal it is always contained in a subdivision of one of the long cells; and one cell is thus divided into nine compartments, each containing its crystal. Regarding the crystal as utterly useless to the plant, as being the result of destructive metabolism and a crystallisation out of and therefore insoluble in its own sap, the tissue itself being strictly mechanical, it seems strange that such crystal should be so carefully isolated.

Terminal Leaf Spine of Agave americana (L.S. and T.S. prepared by grinding).—This is another illustration of the uses of sclerenchyma, here acting as a defensive tissue. Its elements may be, roughly, orbicular, angular, or long-sprouted; in fact, they are of every conceivable shape, often maturing under the pressure of surrounding tissues, and each cell is crushed by the increasing strength of the neighbouring cells; intercellular air-spaces are not to be found here. The cell-walls were originally cellulose, but have been strengthened by successive deposits of lignin. Channels of communication between cell and cell have, however, been left open, and these pores are known as "canaliculi." When two of the sclerenchyma cells touch, these canaliculi correspond in position with each other.—*Thos. S. Beardsmore, Hinckley, Leicestershire.*

FIELD BOTANY.

CONDUCTED BY JAMES SAUNDERS, A.L.S.

Wild Snowdrops.—Early in March this year a small party of cyclists went rambling to gather wild snowdrops. The habitat of these charming flowers is a miniature gorge, with steep narrow sides, roughly tangled with brambles and nettles. The stream below flows over a stony bed, here and there interrupted by a ledge or mass of rock, over which the water falls in a small cascade. It is a sunny, sheltered spot, on the south-west border of Herefordshire, and for a distance of nearly a mile the snowdrops grow in their hundreds, sometimes scattered, sometimes in thick white masses. They

Abnormal Snowdrops.

were in perfection of bloom; taller than their garden sisters, most of the scapes being from nine to twelve inches high. One of these, bearing two flowers, as here figured, measured sixteen inches, and its pair of leaves twelve inches, and it greatly resembled a summer snowflake. One flower was found having four parts to each perianth-whorl and eight stamens. Overhead the alder catkins were dangling in colours of crimson and gold. The more sober-hued hazel catkins were nearly empty of pollen; the little crimson tufts of the female flowers were sprinkled over the bushes. The first primroses were flowering by the stream-side, while on the steep shelving banks coltsfoot was in blossom. A few days later, in another locality, wild daffodils were gathered, and among them was found one with a double-headed scape; but in this case both flowers came out of the summit of the scape, with but one sheath and two pedicels.—*Eleonora Armitage, Dadnor, Herefordshire, March* 17*th*, 1902.

January Flowering of Hazel.—With reference to the note (p. 287, *ante*) regarding pollen-shedding male catkins of hazel observed in the West of England during the week ending January 25th, I may mention that on January 26th

many of these catkins were expanded upwards of three inches in length in this valley at an elevation of about five hundred feet; being in fact so abundant I gathered a few, and subjected them to chemical analysis. The fresh catkins contained 68 per cent. of water, 29·8 organic matter, and 2·2 ash. The dried substance contained about 2 per cent. wax, fat, resin, and a trace of carotin, about 16 per cent. tannin, phlobaphene, rutin, etc., over 10 per cent. sugar, mucilage, etc., 29 fibre, and 6·7 ash. The remarkable feature about the constituents was the considerable quantity of rutin, tannin, and phlobaphene, and I may say that the oxalate of calcium extracted by dilute hydrochloric acid yielded crystals of a size and beauty unparalleled in my experience. Every effort was made to detect starch, but none was found; nor were fruit-sugar or citric acid discoverable in the aqueous or alcoholic extracts. The proportion of mucilage was very large, but the albuminoids seemed rather scanty. The ash of the catkins contained about 31·6 per cent. soluble salts, 22 potass and soda, 7·4 silica, 20·2 oxide of calcium, and 10·2 phosphorus (P_2O_5). According to De Planta dried hazel pollen contains 5 per cent. starch and 31·63 albuminoids, also 7 to 8 cane sugar, but no glucose. I prepared some of the pollen grains as carefully as possible, and applied the iodine test under the microscope, but failed to detect any trace of starch. I may add that the primrose tint of the catkins is due to a trace of carotin, and the brownish shades to dehydrated tannin.—(*Dr.*) *P. Q. Keegan, Patterdale, Westmorland.*

A Maltese Plant.—There are flowering in Malta at the present time some small blue flowers, of which I do not know the name. A curious thing occurred in connection with one of these which interested me, so I thought perhaps I might get an explanation by addressing this to Science-Gossip. I had picked the plantlet by the root and brought it on board, and put it into a little test-tube with some water to grow. One flower came out and expanded well, but was half closed the next morning, so I put it in the sun to see if it would expand again. This seemed to have no effect, so I concentrated the rays of the sun on it by a magnifying glass in such a way that the size of the circle of rays was about one-sixth the size of the glass, or, say, six times the strength of the sunlight, and the flower was inside the focus of the glass. For about a minute nothing happened. At the end of that time I was astonished to see the corolla entire, carrying with it, I afterwards found, the stamens, make a sudden and violent start away from the calyx and stalk. I still kept the light on it, and after about three seconds the corolla, with another most sudden jump, conveyed itself clear of the calyx and stalk altogether, and fell down clear of the plantlet at some little distance on the table by its side. I should be most interested if anyone could give me an explanation of this effect of light on the plant.—*Lieut. D. P. Weston, H.M.S. "Diana," Mediterranean Squadron.*

[Judging from your sketches enclosed and description, your Maltese plant is an *Anagallis*, probably *A. coerulea*. Its near ally, the *A. arvensis*, is frequent in fields and waste places in this country, and from its habit of expanding its flowers only in clear weather it is known as the "Poor Man's Weather-glass." *A. coerulea*, the blue pimpernel, occurs in many places in Britain.—*J. S.*]

Protective Characters in Plants.—In an article in a contemporary the Rev. A. S. Wilson recently treated of protective characters in plants. As an example, the resemblance between the white dead nettle (*Lamium album*) and the stinging nettle (*Urtica dioica*) is given. In order to prove that a case of so-called mimicry is really of protective value three things are required:—(1) It must be shown that the resemblance is sufficiently close to deceive those animals interested in the mimicking species. (2) It must be proved that the imitated species is really protected. (3) That the mimicking species escapes from those enemies which destroy the related, non-mimicking species. As regards the first point, it may be admitted that there is a general superficial resemblance between the two species. Is it sufficient, however, to deceive any animal interested in the dead nettle as a source of food supply? I think not. My daily bread does not depend on my ability to distinguish them, yet the difference is quite obvious to me even at a little distance. Would even the most amateur of botanists admit that he could not readily detect the difference? What, then, if our daily business was to discriminate between them? They would have, for us, less resemblance than an apple has to a gooseberry. So it must be with those animals which depend on the dead nettle as a source of food supply. Again, we all know how much keener the scent of most animals is than our own, and *Lamium album* has a scent totally different from that of *Urtica dioica*. While as regards insects, it has been shown that they are much more probably attracted to plants by scent than by sight. It seems to me, then, that as regards the first point the case breaks down. *Lamium album* is not sufficiently like *Urtica dioica* to deceive any of its enemies which might conceivably be afraid of the latter. As regards the second point, *Urtica dioica*, in spite of its sting, is one of the most persecuted of plants. It is the ordinary food of the caterpillars of three common butterflies, the red admiral, the peacock butterfly, and the small tortoiseshell. The painted lady and the comma butterfly also sometimes lay their eggs on it, as do several species of Plusidae and other lepidoptera heterocera. The nettle is no more protected against these caterpillars than the cabbage is against the "garden white" butterflies. Nettles are also attacked by gall-flies; browsing animals occasionally eat them; snails also consume them. Against what, then, is the nettle protected? As regards the third point, I am not prepared to prove a negative. It is for those who call the resemblance of *Lamium album* to *Urtica dioica* a protective character to bring forward evidence, if there is any. I think, then, I have shown that the resemblance is not sufficiently strong to deceive an interested enemy, and that the imitated species is not really protected. My acquaintance with the literature of the subject and a study of those cases which I have been able to examine for myself lead me to conclude that this applies to a large number of cases of mimicry and protective characters. Let me give one or two illustrations. On the river Amazon Mr. H. W. Bates met with a moth resembling a humming-bird. This is what he says about it: "Several times I shot by mistake a humming-bird hawk-moth instead of a bird. This moth (*Macroglossa titan*) is somewhat smaller than humming-birds generally are, but its manner of flight and the way it poises itself before a flower

whilst probing it with its proboscis are precisely like the same actions of humming-birds. It was only after many days' experience that I learned to distinguish one from the other when on the wing" ("The Naturalist on the River Amazon," p. 181). Note that "after many days' experience" Mr. Bates was able to distinguish them. May we not say, then, much more would the moths' enemies be able to do so? The following is what Sir S. W. Baker says of the elephant: "It is well known that the colour of most animals is adapted by nature to the general tint of the country they inhabit. . . . It may appear ridiculous to say that an elephant is very difficult to be seen! He would be plain enough certainly on the snow, or on a bright green meadow in England, where the contrasted colours would make him at once a striking object; but in a dense jungle his skin matches so completely with the dead sticks and dry leaves, and his legs compare so well with the surrounding tree-stems, that he is generally unperceived by a stranger even when pointed out to him. I have actually been taking aim at an elephant within seven or eight paces when he has been perfectly unseen by a friend at my elbow, who was peering through the bushes in quest of him. . . . The eye and ear become habituated to watchfulness, and their powers are increased in the same proportion as the muscles of the body are by exercise. Not only is an animal immediately observed, but anything out of the common among surrounding objects instantly strikes the attention" ("Eight Years in Ceylon," pp. 111, 112). We may point to the same moral. The individual interested will not be deceived. Again, consider the case of bees and wasps. These have a protective character, their sting; while their colour and form are imitated by a number of flies. Now there is certainly a striking general resemblance in these bee-like and wasp-like flies to real bees and wasps. It is sufficient to deceive the inexperienced. I have, for example, seen a person of average intelligence afraid of a swarm of these harmless wasp-like flies. Probably the ancient myth that a swarm of bees could be generated in the carcass of an ox was due to the deceptive resemblance of those brown bee-like flies, whose maggots live in rotten carcasses, to genuine bees. It only requires, however, a little experience to quite readily be able to detect the sham. I have spent some time in watching these insects rather closely, and I cannot remember ever being deceived by them. Let anyone who doubts this spend, say, one hour a day for a month watching them closely. The same conclusion must be reached—viz., that the sham is readily detected. Can we doubt that their enemies have had much more experience, and are much more keenly interested? Hence they will be much less likely to be deceived. We may further ask, "Are bees and wasps really protected?" The answer is that there are probably few members of the insect tribe more persecuted. I need not here quote particular examples. It is well known that they are greedily devoured by birds, by frogs and toads, and by certain mammals. Thus we see in this case also that the resemblance is not sufficiently close to deceive, and that the imitated species are not protected. On the South Downs here I have noticed a rather curious case of "protection." Certain fungi which grow in irregular lines in the turf have a remarkable resemblance to scattered flint pebbles. To make them out to be vegetables requires careful scrutiny. It might be suggested that this resemblance to stones enables them to escape being devoured by fungus-eating animals. I cannot help feeling, however, that if I were a hungry animal, and fungus was my natural food, I would not pass them by with a superficial glance, but examine them closely, touch them, smell them, and eat them. The whole theory of mimicry and protective characters and their evolution by natural selection is founded on a large number of cases more or less similar to the above, and which, like them, will not bear investigation.—*G. W. Bulman*, 13 *Vicarage Drive, Eastbourne.*

[We have inserted Mr. Bulman's notes for the consideration of our readers without in any way committing ourselves to his opinions. Our columns are open to our readers for their views upon the subject.—Eds, *S.G.*]

Malformed Leaves of Vetch.—Last August, on a bog in South-west Ireland, I noticed a number of branches of *Vicia angustifolia* trailing over the heather plants. They had no flowers, but near the tips of the branches there were many small brown closed-up leaves, closely resembling minute vetch pods, with constrictions, and containing round white objects just like seeds. These curious

Distorted Vetch Leaves.

carpel-like leaflets were submitted to Professor G. Henslow, who reported that they were produced by the attack of mites, some species of *Phytoptus*. The mimicry of small leguminous pods by these malformations was very striking.—*E. Armitage, Dadnor, Herefordshire, March* 17*th*, 1902.

Notes on Surrey Plants.—In my notes upon the plants of Surrey, which appeared in Science-Gossip for last month, the record for *Ranunculus ophioglossifolius* Vill. should be omitted, as the plant, which I found, appears to be upon critical examination a broad-leaved form of *Ranunculus flammula* Linn.—*S. A. Chambers*, 2 *Linden Villas, Leatherhead.*

ANSWERS TO CORRESPONDENTS.

C. E. B. (Camberwell).—It is true that the hills between Barton and Hexton are sometimes purple in places with the blossoms of *Anemone pulsatilla*. The best station is on the east side of the Coombe, known as Barton Springs. If a walking tour is proposed, take the Midland Railway train to Harlington, thence to Barton and back to Luton, a total distance of ten or eleven miles. Any time from the middle of April to the middle of May would be suitable.—*J. S.*

STRUCTURAL AND PHYSIOLOGICAL BOTANY.

CONDUCTED BY HAROLD A. HAIG.

BACTERIOLOGY AS A BRANCH OF BOTANY.—The study of the Schizomycetes or "fission fungi" is interesting from several points of view. First, we may look at them from their true botanical aspect, and, secondly, from the point of view of the pathologist in the investigation of their toxic properties. It is, however, to the latter study that the term "bacteriology" should be applied, for one nowadays most often hears it spoken of in the pathological sense. The botanical histologist may, however, be often called upon to state definitely whether such and such a unicellular organism is a Schizomycete or not, and may in this way be of considerable use to the pathologist. As a matter of fact, in order to settle the whole question one has to look at these organisms from three points of view: (1) botanical; (2) chemical; and (3) pathological; so that to speak of bacteriology as a branch of botany one is not quite correct. Nevertheless we have quite recently seen it stated as such; but we must not regard it as being exclusively so. There is a curious instance of a pathological saprophyte in the disease known as actinomycosis, caused by the presence in the tissues of the human being of the fungus actinomyces, the mycelia of which penetrate into and between the cells, bringing about the formation of multiple abscesses in various parts of the body. The botanical aspect of this case is very interesting, as it shows us that other organisms besides Schizomycetes may infest animals and produce pathological results. The symbiotic relations are very striking, for we see that this saprophyte directs its action especially towards animal tissues, whereas in most cases (lichens, etc.) the symbiotic relation is usually found between two members of the vegetable kingdom, not between animal and vegetable, as in this case and that of Schizomycetes. It may, therefore, be seen, that the botanist can be of especial value to the pathologist, and particularly so if at the same time he appreciates the true physiological aspects of the question.

A "SPORT" IN DIGITALIS.—The "Curiosities Page" of the "Strand Magazine" for March 1902 reproduces a photograph sent by a Bournemouth contributor of a curious foxglove whose apical flower is depicted as having the shape of a Canterbury bell. The photograph appears to be quite bona fide, and the phenomenon is peculiar, for variations in the number and shape of the petals or corolla lobes and the form of the corolla as a whole do not as a rule go so far as to entirely do away with all resemblance to the other flowers of the inflorescence. One has, of course, to consider the possibility of a campanula seed having lodged in the axil of a bract near the apex, and in some way germinated, but this is not very probable. Most likely the phenomenon is a "sport." The text accompanying the photograph does not make any mention of the aspect and disposition of the two inner floral whorls. I think we may assume that these conformed to the Scrofulariaceous type, and not to that of the Campanulaceae. If this point were investigated, the chances would probably be in favour of the four didynamous stamens and not five alternate ones, and of a superior as opposed to the inferior ovary of Campanula.—*Harold A. Haig, London.*

CONDUCTED BY F. C. DENNETT.

	1902 April	*Rises.* *h.m.*	*Sets.* *h.m.*	*Position at Noon.* *R.A.* *h.m.s.*	*Dec.* ° ′ ″
Sun	10	5.19 a.m.	6.45 p.m.	1.12.41	7.42.12 N.
	20	4.57 a.m.	7. 2 p.m.	1.49.36	11.17.23 N.
	30	4.37 a.m.	7.18 p.m.	2.27.13	14.34. 0 N.

	April	*Rises.* *h.m.*	*Souths.* *h.m.*	*Sets.* *h.m.*	*Age at Noon.* *d. h.m.*
Moon	10	6.16 a.m.	1.49 p.m.	9.32 p.m.	1.22.10
	20	4.53 p.m.	10.38 p.m.	3.49 a.m.	11.22.10
	30	0.52 a.m.	5.38 a.m.	10.30 a.m.	21.22.10

	April	*Souths.* *h.m.*	*Semi-diameter.*	*Position at Noon.* *R.A.* *h.m.s.*	*Dec.* ° ′ ″
Mercury	10	10.58·8 a.m.	2·7″	0. 9.59	1.29.47 S.
	20	11.26·1 a.m.	2·5″	1.16.41	6.25.21 N.
	30	0. 4·1 p.m.	2·5″	2.34. 3	15. 5.42 N.
Venus	10	9.12·1 a.m.	14·8″	22.23.10	8.18.26 S.
	20	9. 7·6 a.m.	13·0″	22.58. 7	6. 7.46 S.
	30	9. 5·5 a.m.	11·6″	23.35.27	3.15.25 S.
Mars	20	11.42·0 a.m.	1·9″	1.32.32	9. 8. 6 N.
Jupiter	20	7.16·6 a.m.	17·3″	21. 6.27	17. 7.23 S.
Saturn	20	6. 8·8 a.m.	7·7″	19.58.26	20.37. 0 S.
Uranus	20	3.31·8 a.m.	1·8″	17.20.57	23.13. 4 S.
Neptune	20	4. 5·1 p.m.	1·2″	5.56.17	22.19.29 N.

MOON'S PHASES.

		h.m.			*h.m.*
3rd Qr.	April 1	6.24 a.m.	*New*	April 8	1.50 p.m.
1st Qr.	„ 15	5.26 a.m.	*Full*	„ 22	6.50 p.m.
3rd Qr.	„ 30	10.58 p.m.			

In perigee on April 10th, at 1 p.m.; in apogee on 26th, at 7 a.m.

METEORS.

			h.m.	°
April 17 to 20	Lyrids	Radiant	R.A. 18. 0	Dec. 32 N.
„ 17 to 25	β Serpentids	„	„ 15.24	„ 17 N.
„ 29 to May 6	η Aquarids	„	„ 22.28	„ 2 S.

The last-mentioned are visible a little before sunrise.

CONJUNCTIONS OF PLANETS WITH THE MOON.

			° ′
April 2	Saturn*†	4 p.m.	Planet 5.15 S.
„ 3	Jupiter†	9 p.m.	„ 5.53 S.
„ 5	Venus*	6 a.m.	„ 2.28 S.
„ 7	Mercury*	6 a.m.	„ 6. 1 S.
„ 8	Mars*	Noon	„ 2.25 S.
„ 11	Ceres†	4 a.m.	„ 0.23 S.
„ 30	Saturn	2 a.m.	„ 5.20 S.

* Daylight. † Below English horizon.

OCCULTATIONS.

April	*Star.*	*Magnitude.*	*Disappears.* *h.m.*	*Angle from Vertex.* °	*Reappears.* *h.m.*	*Angle from Vertex.* °
11	δ^1 Tauri	4·2	9.36 p.m.	91	10.15 p.m.	193
12	119 „	4·6	11.23 p.m.	50	Below horizon.	
15	68 Geminorum	5·0	0.36 a.m.	15	1. 9 a.m.	296
21–22	α Virginis	1·2	11.46 p.m.	144	0.52 a.m.	242
29	ρ^1 Sagittarii	3·9	4.20 a.m.	85	5.44 a.m.	245

PARTIAL ECLIPSE OF THE SUN.

There is a very slight partial solar eclipse on April 8th, visible in far northern (arctic) regions in the early afternoon, but quite invisible at Greenwich.

TOTAL ECLIPSE OF THE MOON.

On April 22nd the moon rises at 7.5 p.m. totally eclipsed, about 12 minutes after the middle of the

eclipse. Totality ends at 7.35·4 p.m., the last contact with the shadow occurs at 8.45·4 p.m., and with the penumbra at 9.55·3 p.m. The last contact with the shadow is at a point 60° from the north point towards the west. Dr. C Hillebrand calls attention to the fact that, owing to the effect of refraction, it may be possible, in suitable localities, to see the setting sun close to the western horizon and the eclipsed moon close to the eastern horizon at the eclipse of April 22nd; and on October 17th, the conditions will be reversed the sun in the east and the eclipsed moon in the west.

The Sun, after a long state of inactivity, became very disturbed in the early days of March. In the north-eastern quadrant there was, upon the 6th, a group of large spots covering an oval area having apparently a mean diameter of not less than 43,000 miles. A more elongated group of small spots was visible in the north-western quadrant and a small group of faculae just within the south-eastern limb. On March 9th the area covered by the large group was found to be 86,600 miles by 43,000 miles in extent. A watch should be kept for further outbreaks.

Mercury is a morning star all the month until April 29th, when it is in superior conjunction with the sun at 1 a.m. At midnight on the 23rd Mars and Mercury are in conjunction, the latter being only 40′ to the south. It is not in favourable position for observation.

Venus is a morning star all the month, reaching her greatest elongation west, 46° 12′, at midnight on April 25th, on which date it rises at 3.26 a.m., only an hour and 21 minutes before the sun. Its path is wholly through the constellation Aquarius.

Mars is too near the Sun for observation.

Jupiter and Saturn are morning stars all the month. Saturn rises at 3.9 a.m. on 1st and at 1.19 on 30th, Jupiter rising 40 and 50 minutes later respectively.

Uranus retrogrades along a short path a little north of 44 Ophiuchi, situated a little N.E. of the star θ in that constellation.

Neptune may still be observed in the evenings on the borders of Taurus and Gemini.

New Minor Planets.—The discovery by Dr. Carnera of five of these tiny bodies, one on February 12th, three on March 3rd, and one on March 4th, is announced from Professor Max Wolf's Astrophysical Observatory, Königstuhl, Heidelberg.

"On the Phenomena called Signals on Mars" was the title of a paper read by Mr. Percival Lowell at a meeting of the Astronomical and Astrophysical Society of America in December last. It referred to the bright projections seen upon Mars by Mr. A. E. Douglass on December 7th and 8th, 1900. They are shown by subsequent calculation to have belonged to different parts of the planet. Apparently both were in motion, nearly due west, during the time of observation, and were probably due to clouds.

Brilliant Sun Pillar.—The evening of March 6th was beautified by one of these remarkable phenomena. It seems to have been first noticed by Mr. McHenry Corder, of Bridgewater, the well-known meteor observer, as early as five o'clock. At this time it was white, and there were slight traces of a halo around the sun. Colonel E. E. Markwick at Devonport observed it at 5.50 about 20 m. before sunset. When first seen, nearly all observers agree that it appeared white, deepening in tint to golden, and finally crimson. After sunset it appeared to rise from a low cloud bank, and to have had an altitude of some 20°, gradually shortening. It seems to have disappeared about 6.40 p.m. To Mr. W. A. Knight at Bruton, Somerset, a few light clouds, visible at the same time, appeared to pass behind the pillar. Messrs. Corder and Markwick both note the similarity of its appearance to a comet. It was seen from London and Salisbury on the east, and at Penzance on the west. Its origin was terrestrial, the sun's rays being refracted by ice crystals in the upper regions of the atmosphere. The phenomenon is quite different from the zodiacal light, with which some seem to have confused it.

The Great Comet of 1901.—At the meeting of the British Astronomical Association on February 26th Mr. E. Walter Maunder called attention to the memoir by Professor Brédikhine, Director of the Pulkowa Observatory, on the shape of this comet's tail. This worker many years since made an especial study of cometary tails, with the result that he divided tails into three groups. First type, long and straight, like the tail of great comet of 1861. Second type, the long curved plume, like that of Donati's comet of 1858. The third type, by no means frequently found, where the tails are short and violently curved. These different types are supposed to be caused by the varying molecular weights of the gas or vapour composing them, and therefore of its susceptibility to the unknown repulsive force which forms them. The first comet of the present century, previously to its perihelion passage, showed but a single tail, and that of the first type. After perihelion it exhibited two tails, one of the second and one of the third type. A study of the last-mentioned seems to indicate that it was originated by a great explosion which must have taken place on April 22nd. The second-type tail was somewhat different from those usually observed, in that the central rift was not of the usual conoidal form, but instead conical, having the nucleus at its apex. This is well shown on photographs dated May 5th and May 20th, on which, as also on that of April 24th, the nucleus appeared to have no envelopes on the side towards the Sun. The third-type tail also differed from those usually seen in that form. Instead of being short, it had a length of from 30° to 40° longer than the principal tail. The drawings and photographs from which the Professor drew his conclusions were principally those made at the Royal Observatory, Cape of Good Hope.

Great Meteor.—On the evening of January 7th, at 8.35 Sydney mean time, a very brilliant meteor was observed in New South Wales, at places so far as 370 miles apart. It appears to have radiated from a point in the constellation Octans about R.A. 16 h. Dec. S. 83°, and during visibility fell from a height of 71 miles to that of 28 miles. Its path must have had a length of about 100 miles, which was traversed in about three seconds. A few minutes after its disappearance a terrific explosion was heard, which in some places was so violent as to shake windows and even cause buildings to vibrate. These particulars are gleaned from a paper read by Mr. W. E. Besley before the British Astronomical Association.

CONDUCTED BY C. AINSWORTH MITCHELL, B.A.OXON., F.I.C., F.C.S.

BREATHING UNDER WATER.—Some years ago a diver's helmet was constructed by Mr. Fleuss with the object of enabling the divers to be independent of an external supply of air. In this apparatus the exhaled carbon dioxide is absorbed by caustic potash, whilst the oxygen consumed is replaced by fresh gas from a small portable cylinder communicating with the helmet. The efficacy of this appliance has been frequently demonstrated by Mr. Fleuss, but never in a more striking manner than when he passed through the flooded Severn tunnel, remaining under water for more than thirty minutes. The helmet has also been adapted for the use of firemen, who by its aid are enabled to breathe in an atmosphere of thick smoke. A simpler apparatus on the same lines has recently been devised by Drs. Desgrez and Balthazar, of Paris. The main feature of their invention is the use of sodium peroxide, which was discovered in 1862 by Professor Vernon Harcourt, though it has been but little used, except as a reagent in analytical chemistry. Commercial sodium peroxide is a yellowish-white powder, which is extremely caustic and possesses strong oxidising properties. On exposure to the air it absorbs carbon dioxide in the same way as caustic soda, being converted into carbonate, whilst on treatment with water it is decomposed into caustic soda and gaseous oxygen. Thus on placing sodium peroxide in contact with water in an atmosphere that is being breathed, the carbon dioxide will be continually absorbed and the oxygen renewed by one and the same substance. The apparatus applying this principle contains a clockwork appliance by means of which sodium peroxide is made to fall at regular intervals to water, whilst the violence of the reaction is moderated by a refrigerator. The apparatus is contained in a light circular box of aluminium, and is connected with the helmet by means of two rubber tubes. With the aid of this "oxygen generator" Dr. Balthazar has been able to remain for more than half an hour in an atmosphere saturated with sulphurous acid.

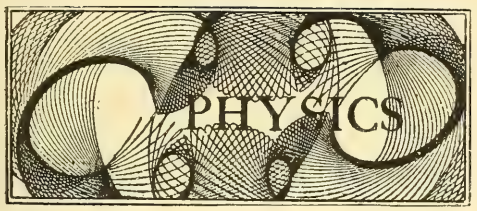
ARTIFICIAL PARTHENOGENESIS.—Greeley has discovered the interesting fact that it is possible to effect the development of the mature unfertilised eggs of the starfish by exposing them in sea-water to a temperature of 4° to 7° C. for one to nine hours. Another striking fact in this connection is the influence of potassium cyanide in prolonging the life of the unfertilised eggs of the sea-urchin, which has recently been demonstrated by Loeb and Lewis. It was found that this salt, which is ordinarily such a deadly poison, when added in a small proportion to the sea-water apparently effected a suspension of the processes which cause the death of the unfertilised eggs. Possibly these processes are of an enzymic character presenting an analogy to the so-called fibrine ferment, which is said to be the agent causing the coagulation of the blood. It has frequently been shown that potassium cyanide has a restrictive influence on the action of various enzymes.

"RED" COD.—Minute red points resembling vermilion have occasionally been observed on dried salt cod, and in 1887 a whole cargo of fish at Lerwick was thus infected. Dr. Edington found the phenomenon was due to a micro-organism, *Bacillus rubescens*, which developed not only on the fish, but also on the salt used by the curers. When grown upon nutrient gelatin a wrinkled colony was formed, in which a pink colour only developed after some weeks. Though this micro-organism was proved to be harmless, the fact of its being present at all showed that the fish were insufficiently preserved, and might thus become a suitable medium for the development of pathogenic bacteria; and as a matter of fact several other species of non-pathogenic micro-organisms were isolated by Dr. Edington, although that mentioned above was the only one that produced a colouring matter. This bacillus is quite distinct from *B. prodigiosus*, which forms a blood-red colony on moist bread, and occasionally on meat. Dantec subsequently found two chromogenic micro-organisms, a bacillus forming terminal spores and a micrococcus, which produced a red pigment when grown upon gelatin, but formed colourless colonies when cultivated by itself upon salt cod.

ACTION OF DISTILLED WATER ON LEAD.—Professor Clowes has made a series of experiments to determine the influence of various salts and gases upon the solvent action of water upon lead. From the results obtained it is evident that carbon dioxide has a restrictive influence, which is greater in proportion to its quantity, whilst free oxygen is the principal active agent. It was also found that of the substances that prevent the solvent action the most effective were sulphuric acid and sulphates, while lime (calcium hydroxide) was much less effective, and when present in large quantities even promoted the action. Distilled water, free from dissolved gases, only dissolved lead to the extent of 0·3 part per million when kept out of contact with atmospheric oxygen. The amounts of lead dissolved by the water in the presence of oxygen and carbon dioxide were as follows:—

——	24 hours	48 hours	72 hours
	Per cent.	Per cent.	Per cent.
Oxygen alone	0·013	0·023	0·029
Carbon dioxide alone ..	0·005	0·008	0·017
Oxygen and Carbon dioxide in equal volumes	0·003	0·003	0·003
Oxygen and Carbon dioxide (8 : 1)	0·015	0·018	——

COMPOSITION OF ANTIQUE STATUETTES.—An interesting communication by M. Berthelot in a recent issue of the "Comptes Rendus" shows that the Chaldeans and Babylonians were possessed of considerable metallurgical skill. A Babylonian statuette was found to consist of a copper alloy containing 79·5 per cent. of copper, 1·25 per cent. of tin, and 0·8 per cent. of iron. A similar statuette from Chaldea estimated to be 2,200 years old was composed of nearly pure copper containing only a slight proportion of iron, whereas another Chaldean statuette, some 400 years older, consisted mainly of an alloy of four parts of copper with one part of lead and a trace of sulphur.



CONTRIBUTED BY W. H. CADMAN.

LORD KELVIN.—We are glad to notice the name of this great physicist included in the modest list of nine distinguished men upon whom the young University of Wales will confer in May the degree of Doctor in Legibus (honoris causa), in celebrating the second installation of a Royal Chancellor.

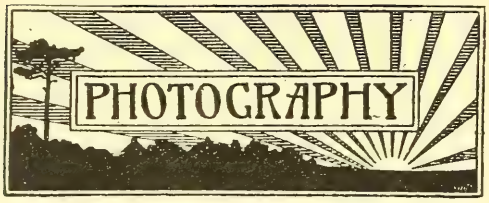
EFFECT OF SMOKE AND GAS UPON VEGETATION.—The extent of injury to agricultural and forestry interests by pollution of the atmosphere in cokeing and other manufacturing operations has received considerable attention during the last few years. W. A. Buckhout has recently noted the condition of vegetation in the immediate vicinity of a number of manufacturing centres in America. The injurious effect of the gases, smoke, and soot is shown by the destruction of forests and orchards in the vicinity of large manufacturing establishments. The most practicable method for the prevention of some of this injury is believed to be the erection of tall smoke stacks or chimneys, in order to secure the most effectual aid in rapid dilution of the gases. Much mischief would be prevented if such works were erected in large open plains instead of in valleys, as is so often the case.

INFLUENCE OF MOUNTAINS ON HAILSTORMS.—This disputed subject has received much attention at the hands of the Italian Meteorological Office. In the last publication Professor V. Monti compares the results of observations for seven years at the typical stations, the Collegio Romano, and Montecavo, an isolated station at an altitude of 1,000 metres, near Rome. Eighty days of hail were observed at Montecavo against forty-one at Rome. During the same period there were 176 thunderstorms at Rome, compared with 129 at the other station. The excess of hail at the mountain station does not appear to be attributable to a greater intensity of atmospheric electricity. The monthly mean temperature at Rome is about 10° C. higher than at Montecavo, and hence Professor Monti suggests that the fusion of hail in crossing the warmer stratum of air may account for the smaller amount at the lower station.

MATHEMATICAL INVESTIGATION OF INTELLECTUAL ABILITY.—The "Proceedings of the Royal Society," No. 456, March 7th, 1902, contain an amusing article on "The Correlation of Intellectual Ability with the Size and Shape of the Head," drawn up by Karl Pearson, F.R.S. Miss M. Beeton, of Girton College, prepared cards giving the name, college, and chief physical measurements of upwards of a thousand Cambridge undergraduates. The nature of the degrees ultimately obtained by them were then compared with these measurements. Tables are given showing the relation between ability and length and breadth of the heads of different men. The author finally concludes that "very brilliant men may possibly have a very slightly larger head than their fellows; but, taking the general population, there is really a very insignificant association between size of head and ability. For practical purposes it seems impossible to pass any judgment from size of head to ability, or vice versâ."

RATE OF RECOMBINATION OF IONS IN GASES UNDER DIFFERENT PRESSURES.—"The London, Edinburgh, and Dublin Phil. Mag." for March 1902 contains an interesting paper on this subject by R. K. McClung, M.A. Any gas which has been exposed to Röntgen rays retains the ionisation thus produced for a short time after the source of radiation has been removed. The negative and positive ions take an appreciable time to recombine with each other. This question of the rate of recombination of ions was investigated by Professor Rutherford for air and some other gases at atmospheric pressure. McClung undertook his research to find the relation between the rates of recombination at different pressures. The rays from an X-ray bulb passed through a brass cylinder containing the electrodes consisting of thin aluminium foil between which the leak was measured. The cylinder was made so that it might be exhausted or subjected to considerable internal pressure as desired. The results obtained show that the rate at which the ions recombine in ionised air is determined by the same law, no matter what the pressure may be—namely, $\frac{dn}{dt} = -\alpha n^2$, where n is the number of ions per c.c. in the gas at any time, t, after the rays have ceased, and α is a constant for any given gas. The same law was found to hold true for hydrogen and carbon dioxide as for air.

ELECTRIC DETONATORS.—It is not, perhaps, generally understood how useless dynamite and other high explosives would be except for the insignificant little detonator. A ton of dynamite may lie secure, yet the smallest Nobel detonator exploded in the mass sets free the terrible resistless power of the dynamite in all its fury. Detonators consist of thin copper tubes closed at one end and filled with a detonating composition consisting of fulminate of mercury and, generally, potassium chlorate. Fulminate of mercury is produced by the action of nitric acid and alcohol upon mercury. It is very sensitive to heat and shock, and, being one of the quickest explosives known, gives an extremely sharp shock, which is exactly what is required to detonate dynamite. Electric detonators usually contain a mixture of antimony sulphide and potassium chlorate as a priming mixture, in addition to the fulminate of mercury. There are two systems of electrical blasting—namely, high tension and low tension. The high-tension E.D. fuses are largely used in Europe. Attached to the ends of the wires embedded in the detonator is a sensitive chemical composition which is ignited by a spark passing between the terminals, resulting in an explosion. Low-tension E.D. fuses have within the detonator a fine platinum wire encased in a suitable flashing mixture; and this wire on becoming heated by the current ignites the mixture, which in its turn explodes the detonator. This system is in almost universal use in tropical countries. The low-tension possess a great advantage over high-tension fuses, in that their efficiency can be tested at any time with a galvanometer.



CONDUCTED BY B. FOULKES-WINKS, M.R.P.S.

EXPOSURE TABLE FOR APRIL.

The figures in the following table are worked out for plates of about 100 Hurter & Driffield. For plates of lower speed number give more exposure in proportion. Thus plates of 50 H. & D. would require just double the exposure. In the same way, plates of a higher speed number will require proportionately less exposure.

Time, 10 a.m. to 2 p.m.

Between 9 and 10 a.m. and 2 and 3 p.m. double the required exposure. Between 8 and 9 a.m. and 3 and 4 p.m. multiply by 4.

SUBJECT	F. 5·6	F. 8	F. 11	F. 16	F. 22	F. 32	F. 45	F. 64
Sea and Sky..	1/300	1/250	1/120	1/60	1/30	1/15	1/8	1/4
Open Landscape and Shipping	1/0	1/64	1/32	1/16	1/8	1/4	1/2	1
Landscape, with dark foreground, Street Scenes, and Groups ..	1/32	1/16	1/8	1/4	1/2	1	2	4
Portraits in Rooms ..	2	4	8	16	32	—	—	—
Light Interiors	4	8	16	32	1	2	4	8
Dark Interiors	1/4	1/2	1	2	4	8	16	32

The small figures represent seconds, large figures minutes. The exposures are calculated for sunshine. If the weather is cloudy, increase the exposure by half as much again ; if gloomy, double the exposure.

PHOTOGRAPHIC YEAR-BOOKS.—The "Process Year-book" for 1901–2, published by Messrs. Penrose & Co., of London, shows a marked advance upon its predecessors. It is full of beautiful pictures, reproduced by the photography of colour and ordinary plain process-work. Some of these are exquisite in artistic production and accuracy. There are many useful articles on various subjects connected with photography. The "International Annual of Anthony's Photographic Bulletin" for 1902, being vol. xiv., is to hand. It is produced in New York, the London agents being Messrs. Iliffe & Sons, Limited. It is published at the price of two shillings, and contains many illustrated articles. Some of the pictures are exceptionally beautiful, and most of them are interesting. The book will be found useful to amateurs, as well as to the more advanced photographers. Messrs. Penrose have also sent their illustrated catalogue, which contains much information. The annual number of "Photography," published by Iliffe & Sons, is beautifully illustrated by a series of the chief photographs of the year. The Thornton-Pickard Catalogue for 1902 contains several important novelties, one of them being the Focal Plane Automan, which is fully described. It is a distinct advance towards obtaining perfect pictures.

LONDON GEOLOGICAL FIELD CLASS.—We understand that the annual series of Saturday afternoon excursions of the London Geological Field Class, conducted by Professor H. G. Seeley, F.R.S., commences on April 26th, when a visit will be paid to Erith. The excursions will be continued on each succeeding Saturday, except on the Saturdays before Whitsuntide and in Coronation week, until July 12th. These excursions will afford the means of examining some of the greater movements which the rocks of the South-east of England have experienced in foldings which changed their level. The denuding action of the sea in levelling the land will be examined and compared with the action of atmospheric denudation, as seen in the forms of the parallel hill ranges and valleys of Surrey and Kent. The work of the session will illustrate the geological structure of the districts known as the Weald and the London Basin. The strata examined will comprise all members of the Neocomian and Cretaceous groups, the Lower London Tertiaries, and the gravels and brick earth of the Thames Valley. Opportunities will be given for collecting fossils from these strata, and from the Upper Oolites, upon which they rest. Further particulars can be obtained from Mr. R. Herbert Bentley, the honorary general secretary, 43 Gloucester Road, Brownswood Park, N.

COCCUS OF THE ORANGE-TREE.—This year I have noticed a greater number than usual of those small dark scales on the rind of oranges which when examined with a pocket lens bear so striking a resemblance in shape and general character to a mussel-shell with its convex side uppermost. I have been much interested in examining these curious relics of creatures whose life-history is so markedly dissimilar to all other known orders of the animal creation. These singular creatures belong to the order Hemiptera, and are closely allied to the aphides. They belong to the Coccidae, the same family as those great pests of the horticulturists, the "mealy bugs," the cochineal insect, "Coccus cacti," of so much mercantile value for dyeing purposes, being also of the same genus. Carefully removing from the orange with a needle one of these scales, and placing it under the microscope, concave side upwards, we usually find the shell is more than half full of oval pearl-like eggs, probably forty or fifty in number, and one wonders how they got there. Singular to say, while the universal law of Nature appears to be progression towards perfection, here we find the exception, in that the female coccus becomes more and more imperfect as she approaches the complete state. Having arrived at maturity she selects the place where she intends to feed, then once for all inserts into the plant leaf, stem, or fruit her proboscis, which cannot afterwards be again withdrawn, and there she remains, destined for the future to be simply an animated stationary suction-pump. Henceforth she gradually

and imperceptibly loses all trace of articulation in body and limbs, until all former resemblance to, or indeed indication of, an insect has completely vanished, and she appears a total wreck, "sans everything." Having laid her eggs, which remain under her, she finally shrivels up to a dry husk, and is now nothing but a protecting shield to the enclosed and underlying eggs. She will never see her progeny, and they can at most only know their poor mother as a snug shed with a low-arched roof from which they will too gladly emerge upon the first opportunity. The male coccus is a small, short-lived, white-winged fly. Mr. C. J. Gahan says: "Some years ago the orange plantations of California were threatened with ruin owing to the ravages of *Icerya purchasi*, which had been accidentally imported from Australia, and had spread with great rapidity. Experts were sent to Australia to try and discover the natural enemies of the insect in its native country. It was found that the scale-insect was there kept in check by dipterous and hymenopterous parasites, but chiefly by the larvae of a lady-bird beetle. A number of these beetles and parasitic insects were brought to America, and set to prey upon the coccidae. When they had multiplied sufficiently they were distributed amongst several orange plantations, with the result that many were soon almost entirely cleared of the scaly bug." In the year 1845 Mr. G. Newport, F.R.S., at that time President of the Entomological Society, said in his anniversary address that "so complete had been the ravages of the coccus of the orange-tree, that one of the Azores—the island of Fayal—lost its entire produce from this cause alone. The usual annual exportation from Fayal had been 12,000 chests; but in 1843 not a single chest was exported." This amount of injury to a whole population by a diminutive and apparently contemptible insect was the result of but three years' ravages. Well might the President say: "The effects of this insect on a single article of luxury might fairly be adduced to show that entomological inquiries are deserving of full attention."—*Samuel Howarth, 26 Grange Crescent, Sheffield.*

Pupa Hunting.—Hunting for lepidopterous chrysalides may be carried on all the year round, but the summer and early autumn months will be found the best. For equipment an ordinary garden trowel and a box filled with moss are all that is necessary, patience and perseverance excepted. It is quite likely that the bag at first will not be a large one, but the pupa digger who at the first unsuccessful essay throws up the hunt in disgust would probably have found his toil amply rewarded at the second or third attempt. It is hoped, however, that the hints given here may save those who have not tried this mode of collecting, the expenditure of a good deal of the time and trouble which are the result of inexperience. First, heavy clay soils should be avoided, or ground which is so hard as to present a serious obstacle to the trowel. Next, when the ground is sodden with recent rain it should be left, and the pupae looked for upon trees or under loose bark and moss. They are, of course, often found when gardening, whilst turning over sods of turf or digging up roots; but these are chance finds as to which no rules can be laid down. By searching methodically in the manner here indicated, the pupae of some rare moths, otherwise difficult to procure, may with tolerable certainty be obtained to breed the perfect insects. The most productive trees are the oak, elm, birch, poplar, ash, hawthorn, and willow. The trowel should be inserted to the depth of about four inches in the interstices of the roots. The sod thus removed may be put on one side and the cocoons gently sought for with the hand, along the under surface of the tree root, to which they are often found to be adhering. The sod should now be lightly tapped with the trowel, and if there are any pupae in it they will probably fall out. If the sod is of light dry earth, it will easily fall apart afterwards by shaking, when a more minute examination may repay the searcher. It is of little use digging at a greater distance than eight inches from the trunk of a tree, and in the case of trees other than those I have mentioned the pupae are more likely to be found under the loose bark or moss than at the roots. Exception must be made in favour of those of *Trachea piniperda* and *Boarmia abietaria*, which are found at the roots of fir and spruce and yew trees. With the approach of winter pupae become more difficult to find. They have many enemies, such as birds, mice, and even earwigs, that feed upon them. The best course then is to commence searching within a few weeks of the transformation from the caterpillar to the pupae stage having taken place. The collector, however, should always be prepared for the possibility of some of his finds drying up. This arises as a rule from their being injured, either before or during their capture, or having been kept too dry. Some are tougher than others, but all require the utmost care in handling. Meadows and parks dotted with trees of large growth make the best hunting grounds. Of the trees, those where the grass beneath has been worn away by cattle or which are situated on the banks of streams are the most likely hunting grounds. A solitary oak or poplar in the middle of a field is an ideal spot for the pupa digger, especially if the soil is dry and friable. Pieces of loose bark still adhering to the tree and every nook and cranny of the tree itself should be carefully examined. In some cases the cocoons will be found concealed between a pair of leaves joined together. The chrysalis of *Platypteryx falcula* chooses the leaves of the birch for this purpose. It is found in June and again in September. Another species of the same genus selects the leaves of the beech. The moss growing at the base of trees should also be carefully removed and examined. Woods, as a rule, will be found unproductive. This does not apply, however, to their extreme edges, nor to the borders of the clearings often to be met with even in the heart of a forest. Clearings in elevated positions and with a northern aspect are the best. When a hard sod has been removed from the base of a tree without result it should, whenever possible, be replaced in the cavity from which it was taken. The earth having been loosened forms a sort of trap, and one may have an excellent find on the next visit. Pupae digging can be recommended as a healthy and interesting pursuit, and rare specimens may be obtained in this way at a season of the year when the hope of capturing fully developed insects of the same species is quite out of the question. Until, however, accustomed to the accompanying physical inconvenience, one must expect some tiring days.—*A. L. Clifford, 37 Saint Augustine Road, Camden Square, London, N.W.*

MESSRS. BLACKIE & SON contemplate a re-issue of "Kerner's Natural History of Plants," a work which in its English form is identified with the name of Professor F. W. Oliver, of University College, London. Professor Oliver's translation, in the production of which he had the assistance of Lady Busk, B.Sc., and Mrs. M. F. Macdonald, B.Sc., was first published some seven or eight years ago. The new edition, which will be issued at a considerably reduced price, will be substantially a reprint of the original English edition, with a few necessary alterations and corrections.

NOTICES OF SOCIETIES.

Ordinary meetings are marked †, *excursions* * ; *names of persons following excursions are of Conductors. Lantern Illustrations* §.

BIRKBECK NATURAL HISTORY SOCIETY.

April 12.—* Bickley, for Chislehurst, St. Paul's, 2.7 P.M. Miss E. Bowers.

GEOLOGISTS' ASSOCIATION, LONDON.

April 4.—§ "Klondike, its Geology and Mining." Professor H. A. Miers, M.A., F.R.S.
„ 12.—* Zoological Gardens. P. L. Sclater and F. E. Beddard.
„ 26.—* S.E.R. Main Line widening (new cutting for Elmstead Station). T. V. Holmes, F.G.S., and C. W. Osman, A.M.I.C.E.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

April 10.—† "Some Species of British Lepidoptera and their Geographical Distribution." R. South, F.E.S.
„ 24.—† "The Lesser British Lepidoptera." Alfred Sich, F.E.S.

HAMPSTEAD SCIENTIFIC SOCIETY.

April 4.—† General Meeting. "The Nature of Scientific Methods." Dr. Wm. Boulting.
„ 9.—§ Photographic Section. "Flower Photography."
„ 11.—† Natural History Section. "Notes on the Flora of Hunstanton and District." C. S. Nicholson.
„ 11.—† "On the Approximation of the Forms of Living Mollusca to their Fossil Prototypes." Hugh Findon.
„ 25.—† Photographic Section. "Demonstration of Silver Printing."

NORTH LONDON NATURAL HISTORY SOCIETY.

April 5.—* Visit to Zoological Society's Gardens, Regent's Park.
„ 8.—§ "Some Extinct Bird Reptiles." Miss H. K. Brown.
„ 8.—† "Notes on some Seaside Plants." C. S. Nicholson, F.L.S.
„ 22.—§ "British Freshwater Fish." G. Hamby.

SELBORNE SOCIETY.

April 4.—Museum Evening and Annual Meeting.

ROYAL INSTITUTION OF GREAT BRITAIN.

April 7.—General Monthly Meeting.

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—SCIENCE-GOSSIP is published on the 25th of each month. All notes or short communications should reach us not later than the 18th of the month for insertion in the following number. No communications can be inserted or noticed without full name and address of writer. Notices of changes of address admitted free.

EDITORIAL COMMUNICATIONS, articles, books for review, instruments for notice, specimens for identification, etc., to be addressed to JOHN T. CARRINGTON, 110 Strand, London, W.C.

BUSINESS COMMUNICATIONS.—All business communications relating to SCIENCE-GOSSIP must be addressed to the Manager, SCIENCE-GOSSIP, 110 Strand, London.

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THE Editor will be pleased to answer questions and name specimens through the Correspondence column of the magazine. Specimens, in good condition, of not more than three species to be sent at one time, *carriage paid*. Duplicates only to be sent, which will not be returned. The specimens must have identifying numbers attached, together with locality, date, and particulars of capture.

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THE Editor is not responsible for unused MSS., neither can he undertake to return them unless accompanied with stamps for return postage.

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